① health
② foods ③ foodstuffs
④ nutrients
⑤ energy
⑥ mineral elements
⑦ vitamins
⑧ body regulators
⑨ adequate diet
⑩ meal planning
⑪ food preparation

FW

Fundamentals of

NUTRITION AND DIETETICS

A WORKBOOK

by

ALBERTA DENT

FORMERLY ASSOCIATE PROFESSOR OF HOME ECONOMICS
NEW JERSEY COLLEGE FOR WOMEN

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PREFACE TO SECOND EDITION

The purpose of college courses in the science of nutrition and its application in dietetics is to guide students in the acquisition of knowledge of the subject, to develop an appreciation of the contributions of nutrition to human well-being, and to encourage the practice of proper food habits. The effectiveness with which these objectives are met depends largely on the degree to which the exercises and problems that accompany the course are related to the life of the individual student.

The present workbook presents the material for such problems and exercises. Although no workbook by one teacher is likely to fit precisely into the course of another teacher, nevertheless all courses in nutrition must cover the same underlying principles. This workbook, accordingly, provides the basic material in the field of nutrition and dietetics. It is intended to supplement whatever standard textbook on the subject is chosen for the course, to serve as a guide to the better understanding of the text material, and to develop an appreciation of the fundamental principles in the choice of food for health. The approach is through the student's own dietary habits and nutritional needs.

In the present edition the new allowances for calories, protein, and important minerals and vitamins recommended by the Food and Nutrition Board of the National Research Council as the goal for nutrition have been incorporated, with suggestions for translating them into terms of everyday foods and palatable meals.

The subject matter of the workbook has been arranged in units in logical sequence, each unit being comprised of a brief introduction, an outline, suggested references, study questions, and problems. However, this arrangement does not necessitate the rigid following of the sequence. Flexible adaptation of the material depends on the individual teacher, who may find it desirable to rearrange, to give greater or less emphasis to certain phases, or to omit entirely certain of the units or problems.

The problems and exercises, after an introductory survey of the field of nutrition and dietetics, consider the composition of food and its use by the body; the principles of nutrition; and the dietary properties, the selection, and the combination of foods. Though comprehensive, these problems and exercises are not intended to be all-inclusive; they interpret and reinforce the study of the textbook. It is not expected that every student will perform every problem. Some of the problems may be adapted to group work; others may be used as class assignments; still others may supply matter for laboratory periods. Certain of the problems may well be set up as educational exhibits with appropriate descriptive posters. By all such devices, I have found it possible to cover the material (with a few exceptions) included in this workbook in a one-semester course with two discussion periods of fifty minutes each and one three-hour laboratory session per week.

Reference readings in several standard textbooks are listed for each unit, as well as suggestions for supplementary readings in books and pamphlets of government and professional agencies. Except for a few periodical references that furnish information more recent than that found in books, the selection of readings in journals is left to the individual teacher.

I wish to make grateful acknowledgment to Teachers College Bureau of Publications, to the Extension Service of the Oregon State Agricultural Service, to the Macmillan Company, to the Bureau of Human Nutrition and Home Economics, to the American Home Economics Association, to the Office of Defense Health and Welfare Services, Federal Security Agency, and to the National Research Council, for permission to reproduce in whole or in part or to adapt certain material as indicated.

Alberta Dent

New Brunswick, New Jersey

June 1943

CONTENTS

page

REFERENCES FOR NUTRITION AND DIETETICS STUDY. vii

DATA AND DIRECTIONS xiii

OBJECTIVES FOR NUTRITION AND DIETETICS COURSES. xix

INTRODUCTION. 1

UNIT ONE: Relation of Nutrition to Health. 6

UNIT TWO: Foods and Foodstuffs 38

Composition and Classification of Food. 41

Calculation of the Nutritive Value of Foods 45

Digestion and Metabolism. 50

UNIT THREE: Principles of Nutrition. 53

Energy Aspects of Nutrition 53

Protein in Nutrition. 68

Mineral Elements in Nutrition 76

Vitamins in Nutrition 94

Body Regulators 129

UNIT FOUR: Nutritional Contributions of the Various Food Groups . . . 134

UNIT FIVE: Construction of Adequate Dietaries for Optimal Nutrition . 144

UNIT SIX: Buying Food for Good Nutrition 176

UNIT SEVEN: Meal Planning and Food Preparation 186

UNIT EIGHT: Evaluation of Food and Nutrition Information 203

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DATA AND DIRECTIONS

Abbreviations

t.	teaspoon(s)	sq.m.	square meter(s)
T.	tablespoon(s)	sh.	share(s)
C.	cup(s)	Cal. or cal.	Calorie(s)
pt.	pint(s)	pro.	protein
qt.	quart(s)	carb.	carbohydrate
gm.	gram(s)	Ca.	calcium
mg.	milligram(s)	P	phosphorus
oz.	ounce(s)	Fe	iron
lb.	pound(s)	vit.	vitamin
cc.	cubic centimeter(s)	min.	mineral
cm.	centimeter(s)	in.	inch(es)
kg.	kilogram(s)	A.P.	as purchased
γ	gamma(s)	E.P.	edible portion
mcg.	microgram(s)	meas.	measure
I.U.	International Unit(s)	wt.	weight

Equivalents

3 t.	1 T.	1 kg.	2.2 lb.
16 T.	1 C.	1 lb.	454 gm. (453.6 gm. actual wt.)
1 C.	1/2 pt.	1 oz.	30 gm. (28.35 gm. actual wt.)
	240 gm.	1 fluid oz.	30 cc. (weighs about 30 gm.)
	240 cc.	1 gm.	1000 mg.
	8 fluid oz.	1 mg.	1/1000 gm. (1000 mcg.)
	16 T.	1 γ	1 mcg.
2 C.	1 pt.	1 mcg.	1/1,000,000 gm.
2 pt.	1 qt.	1 gm. carb.	4 cal.
1 qt.	1000 cc.	1 gm. fat	9 cal.
	1 liter	1 gm. pro.	4 cal.
	weighs about 1000 gm.	1 cm.	0.393 in.
16 oz.	1 lb.	1 in.	2.54 cm.

Conversion Figures

To convert ounces to grams, multiply ounces by 30 (28.35).
To convert pounds to kilograms, divide pounds by 2.2.
To convert kilograms to pounds, multiply kilograms by 2.2.
To convert cubic centimeters to ounces, divide cubic centimeters by 30.
To convert inches to centimeters, divide inches by 0.4.
To convert calories to shares, divide by 100.
To convert protein grams to shares, divide by 2.33.
To convert Ca grams to shares, divide by 0.027.

To convert Fe milligrams to shares, divide by 0.4.
To convert vitamin A International Units to shares, divide by 167.
To convert thiamin milligrams to shares, divide by 0.06.
To convert ascorbic acid milligrams to shares, divide by 2.5.
To convert riboflavin milligrams to shares, divide by 0.09.
To convert milligrams to grams, divide by 1000 by moving the decimal point three places to the left.
To convert micrograms to milligrams, divide by 1000 by moving the decimal point three places to the left.

Conversion Table on Vitamins

Vitamin	Sherman Units	International Units	U.S.P. Units	Milligrams	Micrograms
Vitamin A	1.33	1	1	--	0.6 mcg. of B-carotene
	1	0.7	--	--	--
Thiamin	666	333	333	1	1000
		1	1		3
Riboflavin	333	--	--	1	1000
	1	--	--	--	2.5-3
Ascorbic acid	2	20	20	1	1000
		1	1	0.05	
Vitamin D	--	1	1	--	0.025 mcg. of vitamin D_2 (Calciferol)

Decimals

Calories - round to nearest whole number.
Ounces, grams, milligrams, protein - carry one place.
Ca, P, costs - carry three places.
Fe grams - carry four places.
Fe milligrams - carry one place.

Average Servings of Foods

Food	Measure	Approximate Weight Oz.	Gm.
Milk	1 8-oz. glass	8	240
Egg	1 (out of shell)	1 2/3	50
Bread	1 average slice	1	30
Cereals	1 C. prepared	1	30
	2/3 - 3/4 C. cooked	4-5	25-30 before cooking
Fruits, fresh	1 average serving	3 1/2	100
	In salad	1 2/3	50
	In fruit cup (3 fruits used)	1 - 1 1/2	40-50
Fruits, dried	1 serving cooked	1 - 1 1/2 dry	30-45 dry
Vegetables, fresh	1 average serving	2 1/2 - 3 1/2	75-100
	In salad	1 2/3	50
	In soup	1 2/3	50
Vegetables, dried	1 serving (1/2 C. cooked)	4	30 dry
Meat, fish, poultry	1 medium serving	2 1/2 - 3	75-100
	In salad	1 1/2 - 2	45-60
	In creamed dishes	1 1/2 - 2	45-60
Butter	1 T.	1/2	15
Cream	1 T.	1/2	15
Nuts	1 T.	1/2	15
Cheese	1 1/4-in. cube	1	30

Technique of Weighing

Harvard trip scales with brass weights from 1 to 500 grams are the usual type of scales to be found in the Nutrition Laboratory.

DIRECTIONS

Balance scales with small balance wheel underneath until the pointer swings an equal distance to the right and left and comes to rest directly in the center.

Place the food to be weighed on the left side of the scale; the weights on the right.

For those foods which can be weighed directly on the scale without the use of containers place pieces of cut paper napkins or wax paper of equal size on each scale plate. Rebalance if necessary, and proceed.

If it is necessary to weigh foods in a container, place containers of the same type on each side of the scale, balance, place food to be weighed in the container on the left and weights on the right side of scale.

Methods for Presenting and Comparing Food Values Graphically

1. Percentage method.

A comparison (particularly of a graphic nature) of the nutritive values contributed by various foods and food combinations requires a common basis of one kind or another. Various systems have been and are in the process of being devised to reduce Calories, grams of protein, calcium and phosphorus, milligrams of iron, thiamin, riboflavin, and ascorbic acid, and units of vitamins A and D to a common factor. The percentage method is one of these devices.

Procedure:

a. Look up in an appropriate food value table or calculate from such a table the amount of each nutrient (Calories, protein, calcium, etc.) in each food, combination of foods, or meal under consideration. If working with a combination of foods or a meal, obtain the totals for the nutrients in each.

b. Determine the percentage which each food, combination of foods, or meal contributes to each of the daily recommended allowances for specific nutrients for any given person of a certain age and activity.

Example: The following are the recommended daily allowances for a moderately active man:

Nutrient	Daily Requirement[1]	Standard
Calories	3000	100%
Protein	70 gm.	100%
Calcium	0.8 gm.	100%
Iron	12 mg.	100%
Vitamin A	5000 I.U.	100%
Thiamin	1.8 mg.	100%
Ascorbic acid	75 mg.	100%
Riboflavin	2.7 mg.	100%

A good diet for this man should provide on the average 100 per cent of each of the above recommended allowances. The standards for each nutrient is, therefore, 100 per cent.

c. Determine how nearly each food, combination of foods, or any meal meets the 100 per cent standard for each of the nutrients as follows: Divide the amount of each nutrient in the food, combination of foods, or meal by the figure representing the recommended allowance for that nutrient.

Calories	divided by 3000
Protein grams	divided by 70
Calcium grams	divided by 0.8
Iron milligrams	divided by 12
Vitamin A International Units	divided by 5000
Thiamin milligrams	divided by 1.8
Ascorbic acid milligrams	divided by 75
Riboflavin milligrams	divided by 2.7

[1] See Table 1.

Example: One pint of fresh whole pasteurized milk contains:

Calories	340	divided by	3000	equals	11.3% of 3000 cal.
Pro.	16.2 gm.	divided by	70	equals	23.0% of 70 gm.
Ca	0.581 gm.	divided by	0.8	equals	72.6% of 0.8 gm.
Fe	1.19 mg.	divided by	12.0	equals	9.9% of 12 mg.
Vit. A	940.0 I.U.	divided by	5000	equals	18.8% of 5000 I.U.
Thiamin	0.220 mg.	divided by	1.8	equals	12.2% of 1.8 mg.
Acorbic acid	7.0 mg.	divided by	75.0	equals	9.3% of 75 mg.
Riboflavin	1.062 mg.	divided by	2.7	equals	39.2% of 2.7 mg.

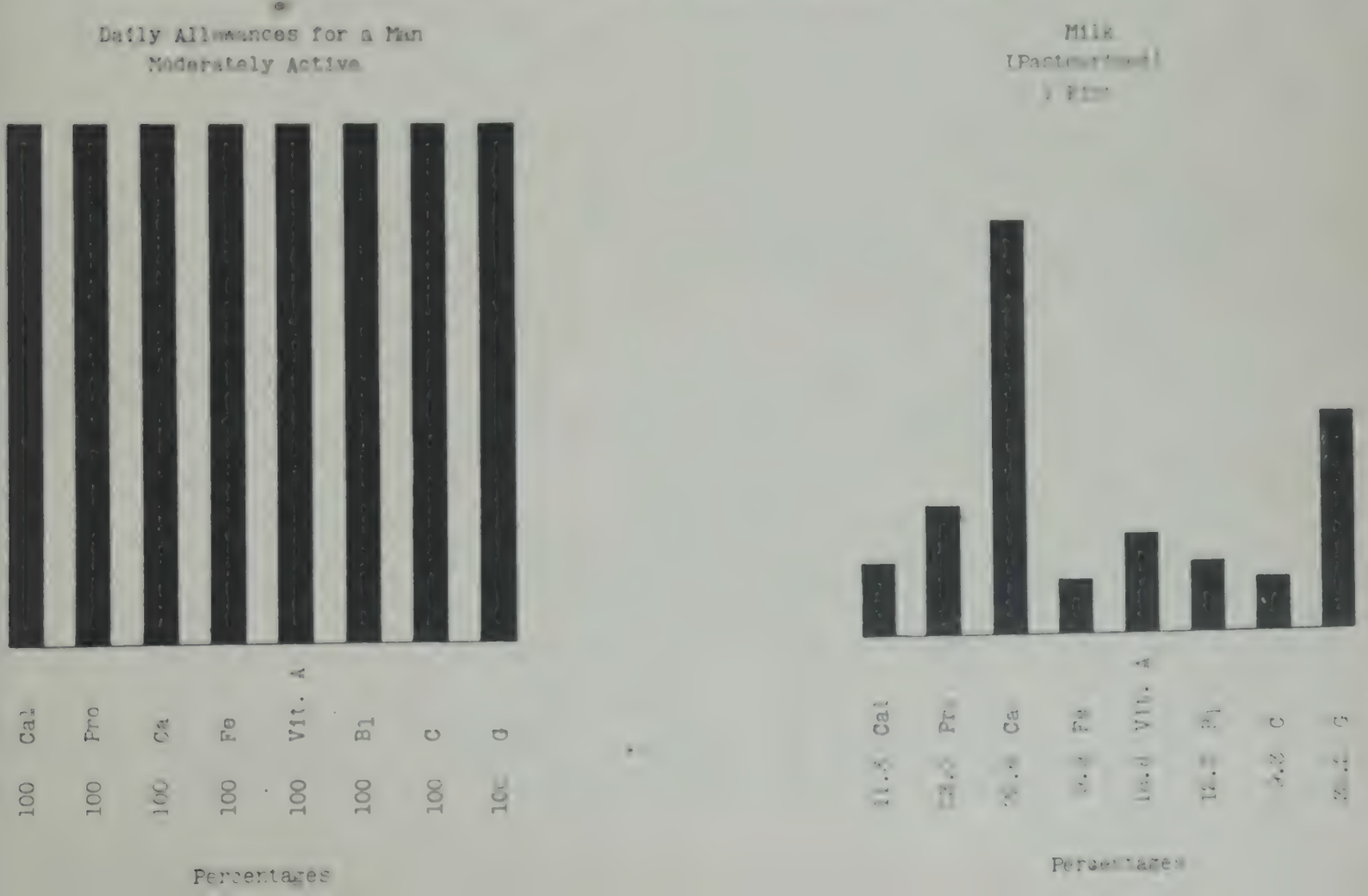
Therefore, 1 pint of milk provides for a moderately active man:

11.3% of his daily requirement for calories
23.1% of his daily requirement for protein
72.6% of his daily requirement for calcium
9.9% of his daily requirement for iron
18.8% of his daily requirement for vitamin A
12.2% of his daily requirement for thiamin
9.3% of his daily requirement for ascorbic acid
39.2% of his daily requirement for riboflavin

See Fig. 1 for a graphic representation of these data.

Figure 1

RECOMMENDED DAILY ALLOWANCES FOR SPECIFIC NUTRIENTS
COMPARED WITH CONTRIBUTIONS IN PERCENTAGES FROM 1 PINT OF MILK



2. Share method.

The share method was first described by Mary Schwartz Rose in her earlier published writings on Nutrition,[1] more recently revised by Clara Mae Taylor and explained in her own publication.[2] Mrs. Rose designated a share of any nutrient as 1/30 of the daily requirement of a man for that nutrient. With the release in the spring of 1941 by the Food and Nutrition Board of the National Research Council of Recommended Allowances for Specific Nutrients (see Table 1), the share is now designated by Dr. Taylor as 1/30 of each of the figures given there for the adult man. The value of 1 share of calories, protein, calcium, iron, vitamin A, thiamin, ascorbic acid, and riboflavin may be determined by dividing the figures for each of these nutrients in Table 1 by 30. Directions for converting calories, protein grams, calcium grams, iron milligrams, vitamin A units, and thiamin, ascorbic acid, and riboflavin milligrams to shares are given under Data and Directions.

Procedure:

a. Look up in an appropriate food table the amount of each nutrient in the food, combination of foods, or meal under consideration.

b. Obtain the number of shares of each nutrient in the food, combination of foods, or meal by dividing the amount of each nutrient by the appropriate share figure (for example, Calories divided by 100, etc.) or

Use Taylor's Food Values in Shares and Weights, Table II, page 7, to determine the shares of the various nutrients.

Example: To convert weights of nutrients in one pint of milk to shares

340 Cal.	divided by	100	equals	3.4 shares
16.2 gm. pro.	divided by	2.33	equals	6.9 shares
0.581 gm. Ca	divided by	0.027	equals	22.0 shares
1.19 mg. Fe	divided by	0.4	equals	2.9 shares
940 I.U. vit. A	divided by	167	equals	5.6 shares
0.220 mg. thiamin	divided by	0.06	equals	3.7 shares
7 mg. ascorbic acid	divided by	2.5	equals	2.8 shares
1.062 mg. riboflavin	divided by	0.09	equals	11.8 shares

To show food values in shares graphically, follow the same procedure as in Fig. 1 but allow 1 square on graph paper for 1 share.

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[1] M. S. Rose. Foundations of Nutrition. The Macmillan Company. First edition, 1927.
[2] C. M. Taylor. Food Values in Shares and Weights. The Macmillan Company. 1942.

OBJECTIVES FOR NUTRITION AND DIETETICS COURSES

A college course in nutrition and dietetics can justify itself only so far as it plays a part in bringing about changed attitudes regarding nutrition and health and in promoting the improvement in the health and general well-being of individuals and groups. Such a course aims at an appreciation and understanding of the contribution of nutrition to health and at an acquisition of sufficient knowledge regarding nutritional essentials and the nutritive value of foods to enable one to choose food for optimal nutrition at all ages, conditions of health, types of activity, and various economic levels. Nutrition courses today must further emphasize the importance and relation of improved nutrition in the United States to the immediate problems of the present war program and later peace program and the need for making nutrition information available to a greater portion of the population.

The following objectives are suggested as reasonable for nutrition and dietetics study. It would hardly be expected, however, that all of these objectives could be completely realized during the period of one short course.

Appreciations

Development of an appreciation of:

1. The nutrition problem as it exists today and of the fact that nutrition has become a national problem.
2. The contribution of nutrition to the well-being of individuals, family and community groups, and the nation as a whole.
3. What constitutes adequate and optimum nutrition and the immediate and far-reaching effects of each.
4. The factors which operate along with nutrition in the development of good health.
5. The necessity for the development of high nutrition and health standards.
6. The many steps and emphases through which nutrition study has passed in its development as a science.
7. Nutrition as a dynamic, not a static, science demanding continual attention to new developments and discoveries.

Knowledges

Acquisition of a knowledge of:

1. The nutritional needs of individuals and groups in terms of the new nutrition standards.
2. The composition of food, the nutritive value of the various groups of foods, and the effects of processing and cooking on nutritive value.
3. The various actions on and the fate of food in the body in digestion, absorption, and metabolism, as well as the factors affecting these three processes.
4. The ways of adapting the principles of normal nutrition to simple dietary disorders.
5. The relation of cost of food to nutritive value.
6. The essentials of adequate food budgets at various economic levels.

7. The considerations in the translation of nutrition standards into palatable and economical meals.
8. The contributions made to the study of nutrition by outstanding investigators in the field.
9. Authoritative sources of nutrition material: books, pamphlets, periodicals, bulletins, etc.

Habits

Development of the habit of:

1. Selecting daily for one's self and family group a diet which furnishes the known nutritional essentials in the proper amounts.
2. Promptness and regularlity in meals, with no omission of meals and no in-between meal eating.
3. Paying attention to one's weight and keeping it within normal limits for height, age, and sex.
4. Critical thinking and judgment in regard to the various "health" foods, measures, and propaganda promoted from time to time.
5. Keeping in touch with current literature dealing with various phases of nutrition and health.

Skills

Development of varying degrees of skill:

1. In the translation of the new nutrition standards into terms of everyday available foods and racial and cultural food patterns.
2. In the ability to combine the foods required daily for good nutrition into nutritious, palatable, and economical meals.
3. In the adaptation of dietaries for normal nutrition to overweight, underweight, simple digestive disorders, and constipation.
4. In judging nutrition and esthetic adequacy of meals and dietaries for different individuals.
5. In evaluating the many sources of nutrition information as well as the qualifications of health lecturers and writers, radio speakers, etc.
6. In the ability to recognize and refute with scientific information the various fads and fallacies in food and nutrition.
7. In the graphic representation of food and nutrition information by means of posters, graphs, charts, tables, exhibits, etc.

INTRODUCTION

From early times humans have been interested in the food they consume, its passage through the body, and its effects. Not until the development of the science of chemistry about the late 1600's, however, could any explanations other than philosophical ones be advanced. As the study of chemistry progressed and furnished information about air as a life essential and about the now well-known respiratory gases, it was not long before the relation of respiration to the use of food by the human body was recognized. Because of Lavoisier's observation in the late 1700's that organic substances burned in the body in a manner similar to the burning of a fuel in a flame, he was destined to become known as the father of the science of nutrition. To him is credited the initiation of the studies which marked the first era of true nutrition investigation.

At the beginning of the present century, the science of nutrition was primarily concerned with the question of energy (Calorie) exchange: the total needs of human for energy and the comparative energy values of the three organic foodstuffs - carbonydrates, fats, and proteins. Very shortly thereafter significant chemical and biological differences were noted among the proteins from various sources, and a new era of nutrition study developed, dealing with the make-up and biological value of proteins and the dietary requirements for them.

Attempts to feed experimental animals purified mixtures of the three organic energy-bearing substances resulted in failure in growth which could be prevented by the addition of small amounts of milk. Investigations showing the need for further nutritional elements in the form of minerals provided material for the third era of nutrition study or what has been known as the "era of little things" in nutrition.

Practically simultaneously with the realization of the importance of minerals came the discovery of the significance of another group of nutritional elements, the vitamins, opening an era of study which, at the present moment, appears to promise unlimited new discoveries.

Today, new knowledge is still developing in each of the above four phases of nutrition study, but the necessity for paying more attention to interrelationships among these phases is well recognized and adopted by Dr. Sherman constitutes a fifth outstanding concept in the present-day science of nutrition. Here again the field has only been touched, and greater developments may be looked for from this angle. Dr. Sherman, in adding a sixth nutritional concept, that of the nutritional reactions of the living body as a whole, has aptly summarized these nutrition eras in what he calls the "six general divisions or aspects or the six pillar concepts which have developed partly in sequence and partly in parallel and upon and around which the twentieth century science of nutrition is being built."[1]

The background courses in the Home Economics curriculum have much to contribute to the study of nutrition and dietetics. Biology and Physiology, Organic, Food and Physiological Chemistry, Food Preparation, Psychology and Economics all furnish a wealth of material of value in the acquisition and application of nutrition knowledge. An analysis of the ways in which these courses can be helpful is worthwhile.

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[1] H.C. Sherman, Food and Health. The Macmillan Company, 1934, Page 101.

Outline of Unit

A. Nutrition and dietetics defined.

1. Lusk's definition of nutrition.
2. Other definitions.
3. Differentiation between "nutrition" and "dietetics."

B. Development of nutrition as a science.

1. Observations leading up to the study of nutrition.
2. First phase of nutrition studied.
3. Contributions of outstanding workers in English, French, and German schools to progress in nutrition study.
4. Development of methods and apparatus for the measurement of energy transformation in the body.
5. Later developments in nutrition study: protein, minerals, vitamins, interrelationships.
6. Development of clinical methods in nutrition.

C. Relation and contributions of other subjects in the home-economics curriculum to the study of nutrition.

1. Science courses.
2. Economics courses.
3. Sociology courses.
4. Psychology courses.

D. Textbook references.

Rose, M.S. Foundations of Nutrition. Chapter I.
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F. Problems.

1. College courses in the study of human requirements for food and the nutritive values of foods are variously termed nutrition, dietetics, nutrition and dietetics, nutrition and health, food selection for health, etc.

What definition of nutrition is given by Lusk?	
What other definitions are given for nutrition and dietetics? Give authorities for definitions.	
If the above definitions do not indicate that nutrition and dietetics are synonymous, how can the two terms be differentiated?	

2. Nutrition study has developed very rapidly since the beginning of the present century.

What discoveries and developments in related fields previous to this period had an important bearing on the development of the science of nutrition?	
Under what five general divisions has the science of nutrition developed?	
Who is called the father of the science of nutrition? Why was this person given such designation?	

3. The names of certain outstanding investigators are associated with the development of the study of nutrition.

List below the names of several investigators (with their past and present affiliations) who have made important contributions to nutrition study. Add to this list as you progress with the study of nutrition.

Name	Affiliations and Contributions

4. A number of courses in the home-economics curriculum contribute to the study of nutrition.

Analyze the content of the following courses required of home-economics majors, and indicate what their contributions might be to the study of nutrition.

Courses	Contributions
Chemistry 1. 2. 3.	
Physiology 1. 2.	
Foods 1. 2.	
Sociology 1. 2.	
Psychology 1. 2.	
Economics 1. 2.	

Unit One

RELATION OF NUTRITION TO HEALTH

The importance of good nutrition as a factor in good health is no longer a matter of opinion held by a limited number of scientists. The scientific achievements of recent years in the field of nutrition, made possible, largely, by improved methods and techniques in research and by greater opportunities for large numbers of observations on short and long time bases as well as newer possibilities for statistical treatment of nutrition investigation data, have left no doubt that the food a person eats affects his physical and mental health. The evidence that normal growth, development, and health in children depends upon the right kinds of foods in the proper amounts is no less objective or conclusive. Dr. McLester is quoted as saying in 1935 that science promises to those who will use the newer knowledge of nutrition, greater vigor, increased longevity, and a higher level of cultural attainment.

Good nutrition is evidenced by the normal composition of body muscles, fat, and bones, by a good supply of blood, by the normal functioning of the various body organs, tissues, and systems, and by high vitality and good resistance to diseases at all ages.

Certain amounts of calories, protein, minerals, and vitamins as furnished by the foods in the daily dietary are known today to be necessary for good nutrition. Recommended allowances for each of these nutrients have been suggested from time to time in line with the rapidly developing newer knowledge of nutrition. In 1935 an effort was made by the League of Nations to formulate dietary standards to serve as a goal for good nutrition. At that time standards during childhood and pregnancy were emphasized.

In 1941, the Federal Government recognised the importance of food and nutrition in defense and military activities and included consideration of this question in the national defense program. The Food and Nutrition Board[1] (formerly the Committee on Food and Nutrition) of the National Research Council established in 1940 to advise on nutrition problems in connection with national defense was asked to define, in accordance with the newer nutritional findings, the recommended daily allowances for the various dietary essentials for people at various ages. This Board subsequently complied with the request and at the time of the opening of the National Nutrition Conference for Defense in Washington in May submitted the now well-known "Recommended Dietary Allowances" for calories, protein, calcium, iron, vitamin A, thiamin, riboflavin, nicotinic acid, and ascorbic acid. These recommendations were published as a guide and as a goal for good nutrition; they are popularly referred to as a "yardstick" for good nutrition. Recommended dietary allowances will be found in Table 1.[2] Two diet plans to meet the dietary allowances are listed on page 8.[3] A poster used in the national nutrition program to emphasize the inclusion of the important foods in the daily dietary is reproduced on page 9. The new version of this food guide prepared by the National Nutrition Program for use during the present period may be found on page 10.

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[1]See "Peacetime and Wartime Functions of the Food and Nutrition Board, National Research Council." Nutrition Reviews, April, 1943, page 161.

[2]Available in pamphlet form, no. 115 of the Reprint and Circular Series, National Research Council, January 1943. National Research Council, 1201 Constitution Avenue, Washington, D.C.

[3]Also listed with discussion in the above pamphlet.

TABLE 1[1]

Recommended Dietary Allowances[2]

Food and Nutrition Board, National Research Council

	Calories	Protein grams	Calcium grams	Iron mg.	Vitamin A[3] I.U.	Thiamin (B_1) mg.[4]	Riboflavin mg.	Niacin (Nicotinic acid) mg.	Ascorbic mg.[4]	Vitamin D I.U.
Man (70 kg.)										
Sedentary	2500					1.3	2.2	15		
Moderately active	3000	70	0.8	12	5000	1.8	2.7	18	75	Note 5
Very active	4500					2.3	3.8	23		
Woman (56 kg.)										
Sedentary	2100					1.2	1.8	12		
Moderately active	2500	60	0.8	12	5000	1.5	2.2	15	70	Note 5
Very active	3000					1.8	2.7	18		
Pregnancy (latter half)	2500	85	1.5	15	6000	1.5	2.5	18	100	400 to 800
Lactation	3000	100	2.0	15	8000	2.3	3.0	23	150	400 to 800
Children up to 12 years:										
Under 1 year[6]	100/kg.	3 to 4/kg.	1.0	6	1500	0.4	0.6	4	30	400 to 800
1-3 years[7]	1200	40	1.0	7	2000	0.6	0.9	6	35	Note 5
4-6 years	1600	50	1.0	8	2500	0.8	1.2	8	50	
7-9 years	2000	60	1.0	10	3500	1.0	1.5	10	60	
10-12 years	2500	70	1.2	12	4500	1.2	1.8	12	75	
Children over 12 years:										
Girls, 13-15 years	2800	80	1.3	15	5000	1.4	2.0	14	80	Note 5
16-20 years	2400	75	1.0	15	5000	1.2	1.8	12	80	
Boys, 13-15 years	3200	85	1.4	15	5000	1.6	2.4	16	90	Note 5
16-20 years	3800	100	1.4	15	6000	2.0	3.0	20	100	

Further Recommendations, Adopted 1942:

The requirement for iodine is small; probably about 0.002 to 0.004 milligram a day for each kilogram of bodyweight. This amounts to about 0.15 to 0.30 milligram daily for the adult. This need is easily met by the regular use of iodized salt; the use is especially important in adolescence and pregnancy.

The requirement for copper for adults is in the neighborhood of 1.0 to 2.0 milligrams a day. Infants and children require approximately 0.05 per kilogram of body weight. The requirement for copper is approximately one-tenth of that for iron.

The requirement for vitamin K is usually satisfied by any good diet. Special consideration needs to be given to newborn infants. Physicians commonly give vitamin K either to the mother before delivery or to the infant immediately after birth.

Revised Recommendations, 1945, available from Food and Nutrition Board, National Research Council, Washington, D. C.

[1]Reprinted by courtesy of National Research Council, Washington, D.C.

[2]Tentative goal toward which to aim in planning practical dietaries; can be met by a good diet of natural foods. Such a diet will also provide other minerals and vitamins, the requirements for which are less well known.

[3]Requirements may be less if provided by vitamin A; greater if provided chiefly as the provitamin carotene.

[4]1 mg. thiamin equals 333 I.U.; 1 mg. ascorbic acid equals 20 I.U.

[5]Vitamin D is unnecessary for older children and adults. Where not available from sunshine, it should be provided probably up to the minimum amounts recommended for infants.

[6]Needs of infants increase from month to month. The amounts given are for approximately 6-8 months. The amounts of protein and calcium needed are less if derived from human milk.

[7]Allowances are based on needs for the middle year in each group (as 2,5,8, etc.) and for moderate activity.

Diet Plans that Meet the Dietary Allowances[1]

In using the recommended allowances it should be emphasized that the amounts of the various nutrients provided for in these recommended allowances, with the exception of vitamin D can be obtained through a good diet of natural foods including foods like enriched white flour and bread which have been improved according to recommendations of the Board.

The safest way to insure that the dietary allowances are met is to include certain foods in the diet daily in specified amounts. One dietary pattern which contains a variety of foods commonly available is given below:

List I

Milk	1 pint
Egg	1 daily, if possible. (On days not used, beans, peanuts, cheese, or more milk or meat to be used instead).
Meat, fish or fowl	1 or more servings
Potato	1 or more
Vegetables	2 or more servings. One green or yellow
Fruits	2 or more. One citrus fruit or tomato or other good source of vitamin C
Cereals and bread	Whole-grain or enriched
Other foods as needed to complete the meals.	

This list is based on the needs of the average adult. For children the milk needs to be increased but the kinds of foods to include remain the same.

Another list using less milk and lean meat is given as illustrative of the varied ways in which the allowances may be met.

List II

Turnip greens	1 cup
Sweet potatoes	3
Peanuts	20 nuts or 2 tablespoons of peanut butter
Beans or cowpeas	1½ oz.
Tomatoes	1 cup
Corn meal	3 oz.
Enriched flour	3 to 4 oz.
Milk (fresh, evaporated or dried)	1/3 qt.
Lean pork	small serving 3 to 4 times a week
Molasses, fat, etc., to complete the meals.	

[1] "Recommended Dietary Allowances." Pages 5 and 6. Reprinted by courtesy of the National Research Council.

For Health

For Health...eat some food from each group...every day!

U.S. GOVERNMENT CHART

IN ADDITION TO THE BASIC 7... EAT ANY OTHER FOODS YOU WANT

Food for Good Nutrition. Courtesy, War Food Administration, United States Department of Agriculture.

The Basic Seven

U.S. needs us strong - eat the basic 7 every day

For health - Eat some food from each group every day

Group one - **Green and yellow vegetables**, some raw - some cooked, frozen, or canned

Group two - **Oranges, tomatoes, grapefruit** or raw cabbage or salad greens

Group three - **Potatoes and other vegetables and fruits**, raw, dried, cooked, frozen, or canned

Group four - **Milk and milk products**, fluid, evaporated, dried milk, or cheese

Group five - **Meat, poultry, fish, or eggs** or dried beans, peas, nuts, or peanut butter

Group six - **Bread, flour, and cereals**, natural whole grain - or enriched or restored

Group seven - **Butter and fortified margarine** (with Vitamin A added)

In addition to the basic 7, eat any other foods you want

[1]See page 11, Consumers' Guide, April , 1943. This new Food Chart is available in quantities from the Superintendent of Documents, Government Printing Office, Washington, D.C.

Outline of Unit

A. Good health as a national resource.

1. Importance of good health for the individual, family, community, nation.
2. Evidences of normal physical development and good health in humans.
3. Factors in good health.
4. Nutrition as a specific factor in health.

B. Nutrition as an individual problem.

1. Characteristics of good nutrition.
2. Essentials of good nutrition for individuals and groups.
3. Importance of the right food and nutrition habits.
4. Effects of deficient, minimum, adequate and optimum nutrition.

C. Study of nutrition by the League of Nations.

1. Beginnings and development of nutrition study.
2. Findings of nutrition study.
3. Recommendations of the Technical Commission on Nutrition.
4. Publications on nutrition.

D. Nutrition as a national problem in the United States.

1. Dietary trends in the United States during the past 50 years and their significance.
2. Present-day dietary habits in the United States.
3. Present status of human nutrition in this country.
4. Effects of inadequate nutrition on the health, efficiency and morale of the population.
5. Suggested ways of improving nutrition in the United States.
6. Allowances for calories, protein, minerals and vitamins suggested by the Foods and Nutrition Board of the National Research Council.

E. National Nutrition Conference for Defense.

1. Events leading up to the calling of the Conference.
   Evaluation of dietary studies.
   Draft figures.
2. Purpose, significance, proceedings, recommendations.

F. Nutrition and the War.

G. Textbook references.

Chaney, M.S., and M. Ahlborn. Nutrition. Chapter I.
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Roberts, L.J. Nutrition Work with Children. Chapters I, II, III, VI, VII, VIII, IX.
Rose, M.S. Feeding the Family. Chapter I.
Sherman, H.C. Food and Health.
Stiebeling, H.K. "Are We Well Fed A Report of the Diets in the United States." U.S.D.A. Misc. Pub. 430.
Survey Graphic. Food for a Stronger America. Reprint, July, 1941, Survey Graphic.
U.S.D.A. 1939 Yearbook. Pages 3-96; 100-123; 124-130.

I. Supplementary questions for study and discussion.

1. What factors affect the state of nutrition in an individual? Discuss each factor.
2. Discuss the objective characteristics of a good state of nutrition; the subjective characterisitcs.
3. Why are food and food habits considered of such great importance in attaining a desirable degree of health?
4. What is meant by "positive" health? Buoyant health?
5. Discuss the different methods available for judging nutrition. What are the advantages and disadvantages of each. Which is considered the best method? Why?
6. Discuss the personal, community, national, and international aspects of good health.
7. How is nutrition related to mental development and ability?
8. Why are both the quality and quantity of food important in bringing about a good state of nutrition?
9. What are the direct and indirect causes of poor nutrition? How does each operate?
10. Discuss the physical and mental results of poor nutrition.
11. What are some of the facilities available for preventing poor nutrition?
12. Study the following in Nutrition Work With Children by Roberts: Outline of Perfect Physical Condition, p. 35, Chart 15, pp. 170-171.

J. Vocabulary of terms to be understood:

active health
buoyant health
deficiency disorder
food
good health
good nutrition
hidden hunger
hollow hunger
index of nutrition
latent deficiency disorder
lateral build
linear build
malnutrition
musculature
nutrition
nutritional essential
nutritional status
optimal nutrition
physical status
positive health
subcritical nutrition
subclinical nutiriton
turgor
undernutrition

K. Problems

1. Proper weight for height and age is considered, along with other factors, a criterion of good nutrition.

a. Using any authoritative height-weight age table, determine the normal weight for your height and age and your percentage over or underweight. Use this normal weight figure for all future calculations. For the duration of the course, weigh yourself weekly at the same time of day and with the same type and amount of clothing. Record data in Table 2.

TABLE 2

Individual Height-Weight Record

Date	Height		Weight (Actual)		Weight (Normal)		Percentage over or underweight
	in.	cm.	lb.	kg.	lb.	kg.	

When is a person considered overweight? Give authority for statements.	
What objections are there to being overweight?	
When is a person considered underweight? Give authority for statements.	
What objections are there to being underweight?	
Are you seriously over or underweight? Jusitfy your answer.	
What percentage of the class falls more than 10 per cent above the standard? between 10.0 per cent and 0.0 per cent? between 0.0 per cent and 10.0 per cent below? more than 10.0 per cent below the standard?	
Is some unusual characteristic of build a possible reason for any great deviation in any of the students?	

2. A complete physical examination is the most accurate means of determining the state of one's health. It is possible, however, for one to recognize certain characteristics which indicate a desirable condition of health.

   a. Score your state of nutrition and health using the score card in Table 3. Consult your medical adviser and physical education record in regard to any items you find it difficult to evaluate.

TABLE 3

Nutrition and Health Score Card[1]

Date _____ Score _____

Age _____ Height _____ Weight _____ Normal Weight _____

	Perfect score	Actual score
Good nutritional condition . . . . . .Total 275		
1. Weight within normal range for height and age. . . . . (Ten per cent or more under the average and twenty per cent or more over the average are out of normal range)	75	
2. Muscles, firm, sufficient flesh.	50	
3. Limbs straight, indicating good bone growth; no signs of previous rickets; no bow legs or knock knees.	100	
4. Skin clear, smooth, neither too dry nor too moist, good color, free from blackheads, good color in mucous membrance.	25	
5. Facial expression normal	25	
Posture - erect and well-balanced . . . . . .Total 200		
1. Head erect, chin in.	30	
2. Back straight, no abnormal curves.	30	
3. Shoulders even, shoulder blades flat across back	30	
4. Chest broad, deep, held somewhat in front of abdomen	20	
5. Abdomen normally flat.	10	
6. Weight carried over center of feet	30	
7. Ankles strong and straight	20	
8. Arches in good condition; no flat feet	20	
9. Feet held straight forward, toes straight.	10	
Chest . . . . . .Total 150		
1. Lungs - good expansion, healthy condition as determined by stethoscope, etc.	75	
2. Heart - healthy condition as determined by stethoscope	75	
Head and throat . . . . . .Total 210		
1. Hair - clean, scalp healthy, free from dandruff.	10	
2. Eyes		
a. Clear, bright, no dark circles or puffiness	20	
b. Vision at least 20/30 without or with glasses.	40	
c. Lids clean, free from irritation	10	
3. Ears - clean, hearing normal	20	
4. Nose - clean, clear unobstructed breathing	20	

[1]Adapted from: Wood's Personal Health Scale, copyright 1925, Bureau of Publication, Teachers College, Columbia University (courtesy of Teachers College Bureau of Publications), and from State of Nutrition Score Card, Oregon State Agricultural College, Extension Service (courtesy of Oregon Extension Service).

	Perfect score	Actual score
5. Mouth and teeth		
a. Teeth, clean, even, strong, free from cavities or cavities properly filled; no tartar	30	
b. Gums clean, firm, pale pink, no receding, no sores	10	
6. Throat - clear, breathing unobstructed, tonsils in healthy condition or removed; adenoids removed	20	
7. No enlarged glands in neck	20	
8. Thyroid gland not enlarged	10	
Hands .....Total 20		
1. Clean	10	
2. Nails, clean, sensibly trimmed, no nail biting or hangnails	10	
Feet .....Total 20		
1. Clean	10	
2. No corns, bunions, calluses, nails in good condition	10	
General health level .....Total 100		
1. Freedom from those diseases for which specific immunity is practically obtainable by vaccination - smallpox, typhoid, diphtheria	15	
2. Freedom from those infections (colds) resulting from unhygienic habits of living and remediable handicaps	15	
3. Freedom from those metabolic errors (evidenced by urinalysis) and other less obvious defects which are revealed only by regular, thorough physical examination	10	
4. Freedom from more than occasional headaches	10	
5. Freedom from constipation	10	
6. Freedom from regularly recurring or persisting pain and discomfort	10	
7. Ability to work with satisfaction and comfort the average week without fatigue	15	
8. Good appetite and relish for food	15	
Stability of nerves .....Total 25		
1. Good self-control as indicated by poise, cheerful disposition, no nervous habits, ability to relax and rest, feeling of being rested and refreshed after a night's sleep	25	
Total	1000	

How do you account for your nutrition and health score?	
If your score is low, how may it be improved?	

Are you in need of any medical treatment to improve your state of nutrition and health? Are you receiving any medical care at present? If so, what?	
List all the nutrition and health habits one should acquire for the best condition of health.	

3. Correct dietary habits are most important in securing and maintaining good nutrition. It is a wise plan to check on your food habits to determine whether your diet contains all the nutritional essentials.

   a. Using one of the dietary sheets, Table 4, for each day, record all the food, beverages, and any dietary supplements which you consume at meals and between meals for one week. For this purpose, the first five columns only will be needed.

   b. Using Dietary Analysis, Table 5, adapted from the revised[1] "Eat the Right Food to Help Keep You Fit" from the Bureau of Home Economics and the more recent "U.S. Needs Us Strong: Eat Nutritional Food"[2] from Office of Defense Health and Welfare Service, list the foods eaten daily as recorded on your dietary record under the heading noted.

   c. Using Food Selection Score Card, Table 5, obtain a numerical score for each of your day's dietary record; indicate the score at the top of each daily record, Table 4, and also on Table 6. Determine your average score for the week.

   d. Using Food Consumption Habits of the Class, Table 7, analyze the food consumption habits of the entire class.

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[1] Available in quantities from Superintendent of Documents, Government Printing Office, Washington, D.C.

[2] Available in quantities from Nutrition Division, Office of Defense Health and Welfare Services, Federal Security Agency, Washington, D.C.

Note: The two pieces of material noted in "b" above will be referred to throughout the remainder of this text as "Eat the Right Food" and "Eat Nutritional Food."

TABLE 4
Dietary Sheet for Record of Meals

Date_____ Day_____ Score_____

Meal Time and place	Food eaten	Kind of food Raw or cooked Method of preparation	Amounts		Total calories	Carb. gm.	Pro. gm.
			Cups, No. of pieces Size, etc.	Wt. gm.			
Totals for day							
Recommended allowances for college student							

Fat gm.	Ca gm.	P gm.	Fe mg.	Vitamins				Fiber gm.	Excess acid	Excess base	Water gm.	
				Vit. A I.U.	Thiamin mg.	Ascorbic Acid mg.	Ribo-flavin mg.					

TABLE 4

Dietary Sheet for Record of Meals

Date_____ Day_____ Score_____

Meal Time and place	Food eaten	Kind of food Raw or cooked Method of preparation	Amounts		Total calories	Carb. gm.	Pro. gm.
			Cups, No. of pieces Size, etc.	Wt. gm.			
Totals for day							
Recommended allowances for college student							

Fat gm.	Ca gm.	P gm.	Fe mg.	Vitamins				Fiber gm.	Excess acid	Excess base	Water gm.	
				Vit. A I.U.	Thiamin mg.	Ascorbic Acid mg.	Ribo-flavin mg.					

TABLE 4

Dietary Sheet for Record of Meals

Date_____ Day_____ Score _____

Meal Time and place	Food eaten	Kind of food Raw or cooked Method of preparation	Amounts		Total calories	Carb. gm.	P
			Cups, No. of pieces Size, etc.	Wt. gm.			
Totals for day							
Recommended allowances for college student							

Fat gm.	Ca gm.	P gm.	Fe mg.	Vitamins				Fiber gm.	Excess acid	Excess base	Water gm.	
				Vit. A I.U.	Thiamin mg.	Ascorbic Acid mg.	Ribo-flavin mg.					

TABLE 4

Dietary Sheet for Record of Meals

Date_____ Day_____ Score _____

Meal Time and place	Food eaten	Kind of food Raw or cooked Method of preparation	Amounts		Total calories	Carb. gm.	Pro. gm.
			Cups, No. of pieces Size, etc.	Wt. gm.			
Totals for day							
Recommended allowances for college student							

Fat gm.	Ca gm.	P gm.	Fe mg.	Vitamins				Fiber gm.	Excess acid	Excess base	Water gm.	
				Vit. A I.U.	Thiamin mg.	Ascorbic Acid mg.	Ribo-flavin mg.					

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			Cups, No. of pieces Size, etc.	Wt. gm.			
Totals for day							
Recommended allowances for college student							

Fat gm.	Ca gm.	P gm.	Fe mg.	Vitamins				Fiber gm.	Excess acid	Excess base	Water gm.	
				Vit. A I.U.	Thiamin mg.	Ascorbic Acid mg.	Ribo-flavin mg.					

TABLE 4
Dietary Sheet for Record of Meals

Date_____ Day_____ Score_____

Meal Time and place	Food eaten	Kind of food Raw or cooked Method of preparation	Amounts		Total calories	Carb. gm.	Pro. gm.
			Cups, No. of pieces Size, etc.	Wt. gm.			
Totals for day							
Recommended allowances for college student							

Fat gm.	Ca gm.	P gm.	Fe mg.	Vitamins				Fiber gm.	Excess acid	Excess base	Water gm.	
				Vit. A I.U.	Thiamin mg.	Ascorbic Acid mg.	Ribo-flavin mg.					

TABLE 4

Dietary Sheet for Record of Meals

Date_____ Day_____ Score_____

Meal Time and place	Food eaten	Kind of food Raw or cooked Method of preparation	Amounts		Total calories	Carb. gm.	Pro. gm.
			Cups, No. of pieces Size, etc.	Wt. gm.			
Totals for day							
Recommended allowances for college student							

Fat gm.	Ca gm.	P gm.	Fe mg.	Vitamins				Fiber gm.	Excess acid	Excess base	Water gm.	
				Vit. A I.U.	Thiamin mg.	Ascorbic Acid mg.	Ribo-flavin mg.					

TABLE 5

Dietary Analysis[1]

Day	Milk	Tomatoes, oranges, grapefruit, green cabbage, raw salad greens		Leafy green or yellow vegetables		Other vegetables and fruits		
		1 serving	2nd serving	1 serving	2nd serving	1 serving	2nd serving	3rd servin

Count: Milk desserts, cream soups, cocoa = 1/2 cup milk
Fruit pudding, gelatine, pie = 1/2 serving of fruit
1 slice bread = 1 serving
2 small rolls = 1 slice bread
1 bun = 2 slices bread
1 large roll = 1 slice bread
1 medium muffin = 1 slice bread

[1]Adapted from "Eat the Right Food," and "Eat Nutritional Food."

Whole grain cereals and enriched breads		Lean meat, poultry, fish		Egg	Fats	Desserts and Sweets	Water	Coffee tea	Omission of Meals	Between meal eating
1 serving	2nd serving	1 serving	2nd serving							

Count: Vegetables in soups, stews, etc. = 1 serving if generous
1/3 - 1/2 cup fruits and vegetables = 1 serving
1/3 cup tomator or orange juice = 1 serving
Bacon - fat
Baked beans - protein

TABLE 6
Food Selection Score Card

Food group	Foods		Perfect score	Daily credits							
I	Milk		20								
	2 cups	20									
	1 cup	15									
	1/2 cup	10									
II	Oranges, tomatoes, grapefruit, Raw caggage or salad greens		15								
	2 servings	15									
	1 serving	10									
	3-4 servings weekly	7									
III	Green or yellow vegetables		15								
	2 servings	15									
	1 serving	10									
	3-4 servings weekly	7									
IV	Other vegetables, fruits, potatoes		15								
	1 serving potato	5									
	2 servings others	10									
	1 serving	7									
	3-4 servings weekly	3									
V	Whole grain products or enriched white bread		10								
	3 servings	10									
	2 servings	7									
	1 serving	3									
VI	Lean meat, poultry, fish		5								
	1 serving	5									
VII	Egg		5								
	1 daily	5									
	3-4 weekly	2									
VIII	Butter and vitamin-rich fat		5								
	2 level T. (1 oz.)	5									
IX	Water		10								
	6-8 cups	10									
	4 cups	7									
	2 cups	3									
	Total score		100								
	Deductions										
	Each meal omitted		10								
	Meals at irregular hours		10								
	Eating sweets between meals		5								
	More than 2 cups of tea and coffee daily		5								
	Final score										
	Average score for week										

Score of 95-100 indicates good food selection.
75-80 indicates fair food selection.
75 and under indicates poor food selection.

TABLE 7

Food Consumption Habits of the Class

Food	Amounts daily	Percentage of class receiving	Food	Amounts daily	Percentage of class receiving
I. Milk	1 pint per day 1/2 pint per day No milk		VI. a. Lean meat, poultry, fish	1 serving per day 1 serving on 1/2 No. of days No servings on any day	
II. Oranges Tomatoes Grapefruit Raw Cabbage Salad greens	2 servings per day 1 serving per day 1 serving on 1/2 No. of days No servings on any day		b. Another protein dish as dried peas, beans, nuts	1 serving per day 1 serving on 1/2 No. of days No servings on any day	
III. Yellow or green vegetables	2 servings per day 1 serving per day 1 serving on 1/2 No. of days No servings on any day		VII. Egg	1 daily 1 on 1/2 No. of days None on any day	
IV. a. Other vegetables, fruits	2 servings per day 1 serving per day 1 serving on 1/2 No. of days No serving on any day		VIII. Butter or vitamin-rich fats	Some at each meal Some at 1 meal None at any meal	
b. Potato	1 serving per day 1 serving on 1/2 No. of days No serving on any day		Between meal eating	Every day Occasionally None at all	
V. Whole grain products or enriched bread and flour	2 servings per day 1 serving per day 1 serving on 1/2 No. of days No serving on any day		Inadequate or no meals	Inadequate or no breakfasts Inadequate or no lunches Inadequate or no dinners	

4. Discussion of individual and class dietary habits.

Discuss your daily food intake in terms of "Eat the Right Food" and "Eat Nutritional Food."	
What numerical average score did you obtain for your weekly dietary record?	
Is your food selection good, fair, or poor according to the numerical evaluation? Why? Explain. If your score is low, why should you make some effort to improve it? How will you improve it?	
Can you observe any correlation between your nutrition and health score and your food selection score? Explain.	
What conclusions can you draw from Table 7 regarding the food habits of the class? What recommendations regarding dietary habits can you make to class members?	

5. Suggested class problem for the term.

Choose one or more of the nutrition experiments suggested by Todhunter and Anderl to determine the effects of adequate and inadequate diets on growth and general well-being. Table 8 may be used for recording data.

TABLE 8

Record of Animal Feeding Demonstration

Diet	Rat.	1st wk.	2nd wk.	3rd wk.	4th wk.	5th wk.	6th wk.	7th wk.	8th wk.	Description of animal
	1									
	2									
	3									
	1									
	2									
	3									
	1									
	2									
	3									
	1									
	2									
	3									
	1									
	2									
	3									

[1] E.N. Todhunter and M.L. Anderl. Experiments for Classroom Teaching: A Handbook for Teachers. College of Home Economics, State College of Washington, Pullman, Washington. 1940. 25 cents.

Unit Two

FOODS AND FOODSTUFFS

Composition and Classification of Foods
Calculation of Nutritive Values
Digestion and Metabolism of Foods

Food is defined as any substance which when taken into the body can be utilized to yield heat and energy, to build new tissue and repair that which has broken down, to regulate body processes, or to aid in the production of secretions, enzymes, etc. The term "food" is ordinarily used to designate articles of food as bread, butter, eggs, cereals, etc. Foods are composed of six classes of foodstuffs--carbohydrates, fats. proteins, minerals, vitamins, and water. Each of these foodstuffs, in turn, is composed of certain chemical elements. One of the chief functions of food is to build and repair body tissues; food must, therefore, resemble this tissue in some way. Such resemblance could not lie in similarity of appearance; it must lie in some other characteristic, namely, chemical composition. Both the body and food are found to be chemically alike in that they are made up of the same elements and compounds.

Foods are classified in many ways; as organic and inorganic, according to function, according to acidic and basic residues, according to carbohydrate content, as protective and energy-bearing foods. Many single foods, having similar composition and nutritional value, are grouped together for convenience in studying nutritive values and the substitution of one food for another. The usual grouping includes milk; grains and grain products; fruits; vegetables; protein foods, as eggs, meats, cheese, fish, nuts; fats; and sugars.

Digestion of food is necessary to convert the complex substances as eaten into simpler forms which can be absorbed and utilized; it is brought about in the alimentary tract by the action of enzymes. Absorption of digested food materials takes place for the most part in the small intestine. Metabolism constitutes all the changes which occur to the absorbed food in the living tissues; anabolic or building-up processes and catabolic or breaking-down processes.

Outline of Unit

A. Chemical analyses of food materials.

1. Methods of determination of foods with and without refuse.
2. Methods of determining carbohydrate, fat, protein, mineral and vitamin content of foods.

B. Classification of food.

1. Usual bases according to chemical composition; functions in nutrition.
2. Newer classification on the basis of protective qualities.
3. Classification of fruits and vegetables according to carbohydrate content.
4. Classification within each group of foodstuffs.
5. Classification on the basis of similarity of nutritive value.

C. Determination of nutritive value from food composition.

D. Digestion, absorption and metabolism of food.

1. Importance of proper digestion and use of food.
2. Mechanical and chemical functions of the alimentary tract.
3. Effect of various factors on digestion.
4. Hygiene of the digestive tract.
5. Fate of foodstuffs in metabolism.

E. Textbook references.

Food Composition and Classification

Chaney, M.S., and M. Ahlborn. Nutrition. Table, Nutritive Value of Foods, Appendix, page 386.

Rose, M.S. A laboratory Handbook for Dietetics. Pages 1-12; 31-41. Tables XVI, XVII, XVIII, XIX, pages 65-272.

Bogert, L.J. Nutrition and Physical Fitness. Chapter I.

Taylor, C.M. Food Values in Shares and Weights.

Digestion and Metabolism

Chaney, M.S. and M. Ahlborn. Nutrition. Chapter XII.

Bogert, L.J. Nutrition and Physical Fitness. Chapters XII, XIII, XIV.

Any recent and authoritative textbook on college hygiene or physiology.

F. General references.

Food Composition

Chatfield, C., and G. Adams. Proximate Composition of American Food Materials. U.S.D.A. Circular 549. 1940.

Chatfield, C., and G. Adams. Proximate Composition of Fresh Vegetables. U.S.D.A. Circular 146. 1931.

Chatfield, C., and L. I. McLaughlin. Proximate Composition of Fresh Fruits. U.S.D.A. Circular 50. 1931.

U.S.D.A. 1939 Yearbook. Food and Life, pages 272-286.

Digestion

Alvarez, W.C. The Mechanics of the Digestive Tract.

Canon, W.B. Digestion and Health.

Rose, M.S. Feeding the Family. Chapter II.

Sherman, H.C. Chemistry of Food and Nutrition. Chapter VI.

Sherman, H.C., and C.S. Lanford. Essentials of Nutrition. Chapter III.

G. Supplementary questions for study and discussion.

1. What will always determine the nutritive value of any foodstuff?
2. Distinguish between foodstuff and food material.
3. How are nutritive materials in foods grouped?
4. In what two ways may food values be expressed? What is the meaning of each? Which is the more accurate?
5. Describe the means used for determining the protein, fat, carbohydrate, ash, and vitamin content of foods.
6. Distinguish between biological and chemical food analysis.
7. Explain the ultimate and proximate composition of a food.

8. Define digestion; absorption; metabolism. Why is each necessary?
9. Distinguish between mechanical and chemical functions of the digestive tract.
10. What conditions affect digestion? In what ways does each do so?
11. What are some rules for promoting good digestion?
12. Distinguish between glands of internal and glands of external secretion. List examples of each.
13. How do ductless glands influence metabolism generally? specifically?
14. How is the coefficient of digestibility explained? Which have, in general, the greater percentage of digestibility - foods from animal or those from vegetable sources? How is the difference explained?
15. In what different ways is the meaning of the term digestibility interpreted? Which is the one more usually meant?
16. What are the means of securing efficient gastric digestion?
17. What factors are involved in the passage of waste food material through the intestinal tract?
18. Discuss the part played by residue, gas-forming foods, organic acids, and lubricants in the elimination of intestinal waste.
19. What is meant by changing the intestinal flora? How may this be accomplished? Of what value is such a change?
20. What other functions in addition to those mentioned above are of importance in securing proper intestinal hygiene?
21. How does cooking affect the palatability, digestion, and nutritive value of foods?

H. Vocabulary of terms to be understood:

absorption
acid-forming
amino acid
amylase
base-forming
carbohydrate
chemical compound
chemical element
coefficient of digestibility
coenzyme
digestion
digestibility
disaccharide
endocrin
enzyme
fat
fatty acid
food material
food principle
foodstuff
glycerol
hormone
hydrolysis
inorganic
intestinal flora
lipase
metabolism
mineral element
monosaccharide
nitrogenous compound
nutrient
organic
peptogenic
peristalsis
protective food
protein
protease
proximate composition
share
substrate
ultimate composition
vitamin
zymogen

I. Problems

Composition and Classification of Food

1. The chemical composition of a food determines its value in nutrition.

a. The chemical elements into which any food may be converted represent the ultimate composition of a food.

List all the chemical elements known to be present in food.

Chemical elements in foods

b. Chemical elements are usually found combined in foods as compounds; these compounds represent the proximate composition of a food and are sometimes called "food principles" or "foodstuffs" or "food constituents" or "nutrients."

List all the compounds known to be present in food, and state their composition in terms of chemical elements.

Compounds	Elements

c. Food materials or articles of food are composed of one, two, or more food constituents (foodstuffs). The food constituent predominating in a particular group of foods determines the special value to the body of each food within the group. Many foods, however, often contain more than one food constituent, some foods being rich in several.

List the foods in which each of the compounds noted predominates.

Sugar	Starch
Fat	Protein

Calcium	Phosphorus	Iron
Vitamin A	Thiamin	Riboflavin
Ascorbic acid	Nicotinic acid	Vitamin D

2. Foods are classified as a. Organic and inorganic b. According to their functions in nutrition. c. According to their acidic or basic properties in the body d. According to their "protective properties or merely energy-giving properties."[1] List foods according to the various classifications noted.	Organic Foods Functions of Foods	Inorganic Foods Examples of Functions

[1] "Nutrition." Final Report of the Mixed Committee of the League of Nations on the Relation of Nutrition to Health, Agriculture and Economics Policy. 1938. Page 64.

	Base-forming foods	Base-forming elements	Acid-forming foods	Acid-forming elements
	"Protective" foods	Partially "protective" foods	Energy foods only	
e. Fruits and vegetables are further classified on the basis of their carbohydrate content. By an early classification, fruits and vegetables are grouped as 5, 10, 15, 20 per cent carbohydrate; by a more recent one as 3, 6, 9, 12, 15, 18 per cent. List the fruits and vegetables under the various carbohydrate groupings.[1]	9%	12%	15%	18%
		3%		6%

[1] G. Adams and C. Smithfield. "Classification of Fruits and Vegetables According to their Carbohydrate Content." Jour. Am. Diet. Assoc.: 10, 383, 1935.

f. Carbohydrates, fats and proteins are further classified into several groups each, on the basis of their chemical composition.

Fill in the accompanying outline.

Foodstuff	Classification	Examples
Carbohydrates		
Fats		
Proteins		

g. Single foods having a similar composition and therefore similar nutritive value may be grouped together for convenience.

List the usual groups into which all foods may be classified.

Calculation of the Nutritive Value of Foods from Food Composition

3. The nutritive value of any single food, prepared dish, or combination of foods may be determined easily if either the percentage composition of each food or the number of grams of each food constituent in a given amount of a food is known.[1]

a. Single foods.

(1) Percentage represents parts per 100 parts. Computations are greatly simplified if the nutritive value of a food can be determined in terms of the gram, the scientific unit of weight. If the 100 parts are, therefore, considered to be one gram parts, the weight in grams of each specific food constituent in 100 grams of the food in question is obtained by simply removing the percentage sign. The weight in grams of each constituent in 1 gram of the food is then obtained by dividing the percentage composition figures by 100. Once the weight of each constituent in 1 gram of the food is determined, it is easy to find the total nutritive value for any weight of the food (ounce, pound, etc.) by the simple proportion:

1 gram (of food) : weight of the food constituent ::
weight of food (in grams) : x (amount of constituent).
Problem I, Pages 31-32.[1]

(2) The caloric value of any amount of a food may be obtained by multiplying the number of grams of carbohydrate and protein in the food by 4 and the number of grams of fat by 9 and totaling these figures. Problem II, Pages 32-33.

(3) One-hundred-calorie portions of foods afford one basis for comparing one food with another. The weight of the 100-calorie portion of any food may be obtained by the following proportion:

calories in 1 gram : 1 gram of the food ::
100 calories : x (weight of food yielding 100 calories).
Problem III, Pages 33-34.[1]

(4) It is sometimes desirable to know what part of the total calories in the 100-calorie portion of food is furnished by carbohydrate, fat, and protein, respectively. To determine this, the weight of each constituent in 1 gram of the food is multiplied by the total weight of the 100-calorie portion, and the resulting figures for carbohydrate, fat, and protein are multiplied by 4, 9, 4, respectively. Problem IV, Page 34.[1]

(5) Cost is often determined in connection with the nutritive value of a food. The following proportion may be used:

weight of the market unit of the food (converted to grams) :
cost of the market unit :: weight of the food (in grams)
for which price is desired : x
Problem V, Page 35.[1]

Examples

(6) Determine the grams of protein, fat, carbohydrate, calcium, phosphorus, and iron, the calories, and the cost of 1 gram, 1 ounce, 1 pound, and the 100-calorie portion of eggs and whole-wheat flour for which the percentage composition is given. Record data in Table 9.

[1] M.S. Rose, A Laboratory Handbook for Dietetics. The Macmillan Company. Fourth edition. 1937. Pages 31-48. Adapted by courtesy of the Macmillan Company, Publishers.

TABLE 9

Nutritive Value of Eggs and Whole Wheat Flour

Food	Weight		gm.	Pro. gm.	Fat gm.	Carb. gm.	Cal.	Ca gm.	P gm.	Fe mg.	Cost[1]
Eggs			1								
		1 oz.									
	1#	16 oz.									
							100				
Whole-wheat flour			1								
		1 oz.									
	1#	16 oz.									
							100				

Data: Percentage composition:

	Eggs	Whole-wheat flour
Protein	13.4%	13.8%
Fat	10.5%	1.9%
Carb	****	71.9%
Ca	0.063%	0.01%
P	0.224%	0.176%
Fe	0.00313%	0.0012%

1 dozen eggs average 24 ounces and cost per dozen approximately _____

Whole wheat flour costs per 3-1/2 pound bag approximately _____

(7) What is the percentage composition of

(a) 1 medium potato which weighs 120 grams and contains
- 2.8 grams protein
- 0.5 gram fat
- 22.0 grams carb.
- 0.014 gram Ca
- 0.063 gram P
- 0.00108 gram Fe

(b) 1 medium grapefruit which weighs 200 grams and contains
- 3.6 grams protein
- 2.0 gram fat
- 44.5 grams carb.
- 0.042 gram Ca
- 0.04 gram P
- 0.0006 gram Fe

Record data in Table 10.

TABLE 10

Percentage Composition of Potatoes and Grapefruit

Food	Meas.	Wt. gm.	Pro. %	Fat %	Carb. %	Ca %	P %	Fe %
Potato	1	120						
Grapefruit	1	200						

[1]Use local current prices for all problems throughout the book where cost is figured.

b. Prepared dish.

(1) The nutritive value of any recipe may be obtained by determining, either from tables or by actually weighing, the weight of each ingredient in the recipe and the grams of each food constituent for the given weight of each food, and then totaling the grams of each food constituent in the various foods. To determine the calories in the recipe, multiply the total number of grams of protein, fat, and carbohydrate by 4, 9, 4, respectively, and total these figures. To determine the food values in one serving divide all total figures by the number of servings. Problem VI, page 36.[1]

(2) Occasionally it is desirable to know the measure of the 100-calorie portion of a prepared food. To learn this, the weight of that amount of the recipe which will furnish 100 calories must be determined. Divide the total calories of the recipe into 100 to obtain the percentage of the whole recipe furnishing 100 calories. Multiply each of the total figures of the recipe (weight, calories, protein, etc.) by the per cent figure to obtain the measure, weight, and amount of each constituent in the 100-calorie portion. Problem VII, page 37.[1]

Example

(3) Calculate the nutritive value and cost of the following recipe, which makes 5 servings, and the nutritive value and cost of 1 serving and of the 100-calorie portion. Record data in Table 11.

TABLE 11

Nutritive Value of Baked Custard

Material	Meas.	Wt.[2] Gm.	Prot. Gm.	Fat Gm.	Carb. Gm.	Ca Gm.	P Gm.	Fe Mg.	Total calories	Cost
Milk	2 cups									
Eggs	2									
Sugar	4 T.									
Salt	1/8 t.									
Vanilla	1/2 t.									
Totals cooked										
Average serving										
100-calorie portion										

Per cent for 100-calorie portion equals _____

Data: Salt and vanilla have no nutritive value; cost for both about 1 cent
1 cup milk is 8 oz. or 240 gm.; costs per quart _____
1 egg averages 50 gm. E.P., costs per dozen _____
1 T. sugar weighs 12 gm., costs per pound _____

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[1] M.S. Rose. A Laboratory Handbook for Dietetics. The Macmillan Company Fourth edition., 1937. Page 31-48. Adapted by courtesy of the Macmillan Company, Publishers.

[2] E.F. Whiteman and F.B. King. "Weights of Food Materials Used in Food Preparation." Jour. Home Econ.: 29, 641, 1937.

c. Combination of foods.

(1) The nutritive value of any combination of foods or a complete meal may be obtained by determining the nutritive value of each single food or serving of a prepared food and totaling all items; of a complete dietary by calculating the nutritive value of each food in each meal, totaling the figures for each meal and obtaining the grand total. Problem IX, pages 41-48.[1]

Example

(2) Calculate the nutritive value of the following breakfast menu:

TABLE 12

Nutritive Value of a Breakfast Menu

Material	Meas.	Wt. gm.	Cal.	Pro. gm.	Ca gm.	Fe mg.	Vit. A I.U.	Thiamin mg.	Ascorbic Acid mg.	Ribo-flavin mg.	Cost
Orange juice	6 oz. glass										
Oatmeal	1/2 cup	30 gm. Dry wt.									
Poached egg	1	50									
Toast	1 slice	30									
Butter	1 sq.	7									
Coffee	1 cup										
Cream - light	1 T.	16									
Sugar	1 t.	4									
Totals											

Data: 1 orange equals approx. 3 oz. juice; costs per dozen _____
1 pkg. of oatmeal (20 oz.) costs _____
1 loaf bread (1 lb.) costs _____
1 lb. butter costs _____
1/2 pint cream costs _____

[1] M.S. Rose, A Laboratory Handbook for Dietetics. The Macmillan Company, Fourth edition, 1937, Pages 31-48. Adapted by courtesy of the Macmillan Company, Publishers.

d. To gain experience in representing nutritive values by the percentage and share methods, calculate and indicate in the following table the percentage contribution of the breakfast in Table 12 to your own daily requirements for each of the nutrients (Table I) and also the shares of each nutrient in the breakfast. (See conversion data under Data and Directions.)

TABLE 13

Nutrients in a Meal Expressed as Percentages and Shares

Nutrients in breakfast	Daily recommended allowances for college students in weights	Percentage contributed by breakfast	Daily recommended allowances for college student in shares[1]	Shares contributed by breakfast in Table 12
Calories				
Protein				
Calcium				
Iron				
Vitamin A				
Thiamin				
Ascorbic acid				
Riboflavin				

[1] C.M. Taylor. Food Values in Shares and Weights. Table I, page 6.

Digestion and Metabolism

4. Proteins, fats, and carbohydrates, as they occur in foods, cannot be absorbed and utilized by the body. They must accordingly be charged into simpler substances during their passage through the alimentary tract. These changes are brought about by chemical enzymes. Review the digestion of foods as discussed in hygiene and physiology courses.

   a. Secure a complete and clear illustration of the digestive tract, and place in the space below. If an illustration is not available, make a sketch of the alimentary tract showing all parts and accessory organs clearly.

Fig. 2. Diagram of the Alimentary Tract

b. In Table 14, describe the mechanical and chemical functions of each part of the alimentary tract.

TABLE 14

Functions of the Alimentary Tract

Parts of alimentary tract and accessory organs	Mechanical functions	Names of juice or juices	Chemical Functions	
			Name of enzyme	Action of enzyme
Parts of tract				
Accessory organs				

c. In Table 15, show the steps through which each of the foodstuffs passes from the time of ingestion to its final fate in the body.

TABLE 15

Digestion and Metabolism of Foodstuffs

Foodstuff	Changes occurring during digestion in			Form or forms in which absorption occurs	Fate in metabolism
	Mouth	Stomach	Intestine		
Carbohydrates					
Fats					
Proteins					

Unit Three

PRINCIPLES OF NUTRITION

Energy Aspects of Nutrition

Energy is defined as the "power to do work." Like an engine or machine, the body has certain work to do and requires energy for this work. Foods furnish energy to the body, carbohydrates, fats, and proteins being sources of energy. Energy is measured in heat units expressed as calories. The large calorie, often written the Calorie, used in nutrition is the unit or standard for the measurement of the fuel value of a food. It represents the amount of heat which will raise the temperature of 1 kilogram of water 1 degree Centigrade or 1 pound of water 4 degrees Fahrenheit.

The number of calories furnished by food depends upon their composition and the way the body uses them. Generally, foods which have a high fat or carbohydrate and a low water content yield a large number of calories, and the foods high in water and residue are low in calories.

The energy requirement of the body, also expressed in calories, includes both the amount of energy needed for internal work or activities and the amount needed for the various types of external activities. Carbohydrates provide approximate 50-60 per cent of the total calories for the adult and 50 per cent for the child; fats supply 30-40 per cent of the total calories for adult and 35 per cent for the child; proteins supply 10-15 per cent of the calories required by an adult and 15 per cent of those required by the child. On the basis of kilograms of average body weight, an adult requires 4-6 grams of carbohydrate, 1-2 grams of fat, and 2/3 to 1 1/2 grams of protein per kilogram; a child, 9-10 grams of carbohydrate, 3-4 grams of fat, and 2-3 grams of protein per kilogram.

For optimal nutrition at least 50 per cent of the total daily energy requirement should be supplied by the "protective" foods, milk, fruits, vegetables, eggs, and whole grain products.

Outline of Unit

A. Food as a source of energy.
   1. Formation of energy-bearing substances in plants.
   2. The unit of measure for fuel and energy.
   3. Measurement of the energy value of foods.
      a. Principle of the bomb calorimeter and the oxycalorimeter.
   4. Physical versus physiological fuel values.
      a. Reasons for differences in oxidation of foods within and without the body.
      b. Coefficients of digestibility of the various foodstuffs.
   5. Chemistry, classification, digestion, and functions of carbohydrates and fats.
   6. Proteins as energy bearing substances.

B. Energy requirement of humans.
   1. Reasons for the need of the body for fuel.
   2. Quotas to be covered in meeting energy needs.

3. Methods of determining and comparative value of each.
4. Energy requirements of children and adults; during pregnancy.
   a. Requirement for each energy food.
   b. Total energy requirement.

C. Basal metabolism as a factor in total energy requirement.

1. Meaning and extent.
2. Factors and their effects.
3. Bases and methods of determination.
   a. Direct versus indirect calorimetry.

D. Shortage and surplus of calories.

1. Causes of under and overnutrition in children and adults.
2. Factors to be considered in feeding for over and underweight.
3. Dangers of following unintelligent methods of reducing.
4. Fads and fallacies regarding weight reduction.

E. Textbook references.

Bogert, L. J. Nutrition and Physical Fitness. Chapters II, III, VII, VIII.
Chaney, M. S., and M. Ahlborn. Nutrition. Chapters II, III, IV.
McCollum, E. V., E. Orent-Keiles, and H. G. Day. Newer Knowledge of Nutrition. Chapters III, IV.
Rose, M. S. Foundations of Nutrition. Chapters II, III, IV, V, VI.
Rose, M. S. A Laboratory Handbook for Dietetics. Pages 7-8; 13-191.
Sherman, H. C. Chemistry of Food and Nutrition. Chapters II, III, VIII, IX, X.
Sherman, H. C. Essentials of Nutrition. Chapters IV, V.

F. General references.

Bloor, W. R. "Handbook of Nutrition: III Role of Fat in the Diet." Jour. Am. Med. Assoc.: 119, 1018, 1942.
DuBois, E. F. Basal Metabolism in Health and Disease. Chapters II, V, VI, VII.
Mitchell, K. The Deuce of Reducing. Covici Friede. 1937.
Sherman, H. C. Food Products. Chapters XIII, VIII, XI, XII.
Sherman, H. C. Food and Health. Chapters III, IV, V, VI; Pages 161-164; 177-179.
Taylor, C. M. How's Your Weight? Woman's Home Companion, Publisher. 1937.
U. S. D. A. 1939 Yearbook. Food and Life, pages 152-172.

G. Supplementary questions for study and discussion.

1. Distinguish between a carbohydrate, fat, and protein as a source of energy. Which is the most economical source of energy? Why?
2. What are the specific functions attributed to carbohydrates and fats in nutrition?
3. Define the following: disaccharide, unsaturated fatty acid, saturated fatty acid; mixed fat; conjugated fats; simple fat; hydrogenated fat.
4. Of what special significance are phospholipins and sterols in nutrition?
5. What functions do food fulfill in the body? Give examples of each function.
6. Define the Calorie. How is it used in nutrition?
7. What determines the fuel value of any food? What foods are high in energy value? low in energy value?

8. How does cooking affect the fuel value of a food?
9. Describe the two ways which are available for determining the fuel or energy value of a food.
10. How does the burning of fuel foods within the body compare with and differ from their burning outside the body? To which does the term "physical" apply? the term "physiological"? Which figures are used in determining the fuel values of foods as eaten? Why?
11. Why is appetite a poor guide in determining one's fuel requirement?
12. Distinguish between direct and indirect calorimetry as a means of determining energy needs. Explain each method. How do these compare with the methods of determining fuel values of foods?
13. What relation does insensible perspiration bear to energy metabolism?
14. Describe in detail the procedure for carrying on a dietary study in your college dining hall, sorority, or cooperative house. What would be accomplished by such a plan?
15. Discuss the three conditions or quotas which make it necessary to supply the body daily with sufficient fuel foods. Does mental work increase our need for energy foods? Why? How do these quotas compare with those of the child?
16. How is the specific dynamic action of each of the energy foodstuffs explained?
17. What physical and chemical means are available to the body for regulating body temperature?
18. By what two methods may the correct number of calories needed by an individual be determined? Which is the more accurate? Why?
19. Discuss the relationship of food intake to body weight.
20. Make a list of suggestions for the person who wishes to lose weight; for the one who wishes to gain weight.
21. Why should carbohydrate foods never be entirely omitted from the diet of the overweight person?
22. What constitutes basal metabolism? What are the standard conditions under which it must be determined?
23. Explain and illustrate "specific dynamic action" of foodstuffs.
24. What three bases are used for determining one's basal metabolism? Whose name is associated with each?
25. Of what value is a knowledge of an individual's basal metabolism and requirement?
26. List and explain each of the factors which influence one's basal metabolism.
27. How do the energy requirements of children in proportion to body weight compare with those of adults? of young adults with those of older adults?
28. Explain what is meant by photosynthesis.
29. Compare the energy requirements of the average adult woman with those during pregnancy and lactation.
30. What percentage of the total calorie requirement should be furnished by carbohydrates? fats? proteins?

H. Vocabulary of terms to be understood

adrenalin	cholesterol	ergosterol
basal metabolism	coefficient of digestibility	hormone
bomb calorimeter	conjugated fat	hydrogenated fat
calorie	direct calorimetry	indirect calorimetry
calorimetry	douglas bag	internal secretion
chemical regulation	ergometer	lecithin

lipid	physical regulation	sterol
mixed fat	physical fuel value	surface area
oxycalorimeter	physiological fuel value	thyroxine
phospholipin	saturated fatty acid	triglyceride
photosynthesis	specific dynamic action	unsaturated fatty acid

I. Problems

1. One-hundred-calorie portions or 100 gram portions or average servings may be used to compare the energy value of foods.
   a. Weigh 100-calorie portions[1] of the more commonly used sugars, starches, fats, protein foods, fruits, vegetables. Obtain for each portion the measure (in teaspoons, tablespoons, cups, number of pieces, dimensions, etc.) and cost; display these portions and discuss. Record data in Table 16.
   b. Weigh 100-gram portions of the foods suggested under a.
   Obtain for each portion the measure, caloric value and cost; display portions for discussions. Record data in Table 16.
   c. Determine the measure of the average serving[2] of each of the foods suggested under paragraph a. Weigh each food to determine the weight of the average serving, determine its calories and cost; display foods for discussion. Record data in Table 16.

[1] Consult tables of nutritive values in nutrition textbooks and handbooks for weights of 100-calorie portions and measures of average servings.

[2] See Data and Directions, Average Servings, page XV.

TABLE 16

*Energy Value of Foods

Food	100-calorie portion			100-gram portion			Average serving			
	Wt. gm.	Meas.	Cost	Meas.	Cal.	Cost	Wt. gm.	Meas.	Cal.	Cost
Sugars										
Starches										

TABLE 16 (continued)

Energy Value of Foods

Food	100-calorie portion			100-gram portion			Average serving			
	Wt. gm.	Meas.	Cost	Meas.	Cal.	Cost	Wt. gm.	Meas.	Cal.	Cost
Fats										
Protein foods										

TABLE 16 (continued)

Energy Value of Foods

Food	100-calorie portion			100-gram portion			Average serving			
	Wt. gm.	Meas.	Cost	Meas.	Cal.	Cost	Wt. gm.	Meas.	Cal.	Cost
Fruits										
Vegetables										

2. Prepare and determine the grams of protein, fat, carbohydrate, calcium, and phosphorus, the milligrams of iron, the calories, and the cost of some commonly used recipe or some "in-between-meal" snack popular with college students.
   a. Proceed as for any recipe except that all foods must be weighed.
   b. Measure all ingredients carefully.
   c. Weigh each measured ingredient and record the weight. It is not necessary to weigh water, spices, salt, leavening agent, or flavoring substances as they have no food value.
   d. Weigh the utensil or utensils in which the food is to be cooked and record the weight. Prepare utensils as usual as to greasing, etc.
   e. Follow directions for mixing the recipe, and cook or bake according to the usual directiohs.
   f. Cool the utensil and contents and weigh: total weight minus the weight of the pan equals the weight of the cooked food. Obtain the measure of the cooked food and the number of servings.
   g. Make calculations as follows.
      (1) Compute the grams of protein, fat, carbohydrate, calcium, and phosphorus, the milligrams of iron, cost of each ingredient in the recipe. Total all columns.
      (2) Determine the measure, weight, and nutritive value of the average serving by dividing all total figures by the number of servings.
      (3) Determine the 100-calorie portion of the recipe by dividing 100 by the total number of calories in the recipe to get the percentage of the recipe to yield 100 calories; calculate the percentage of the total figures to obtain the weight and the nutritive value of the 100-calorie portion; weigh the 100-calorie portion and obtain the measure; calculate the shares in the average serving, if desired.

   Record all data on Table 17.

TABLE 17

Nutritive Value of a Recipe for Cooked Dish

RECIPE DATE

Material	Meas.	Wt. gm.	Pro. gm.	Fat gm.	Carb. gm.	Ca gm.	P gm.	Fe mg.	Vit. A. I.U.	Thiamin mg.	Ascorbic acid mg.	Ribo-flavin mg.	Cost
Totals-cooked													
100-Calorie portion													
Average Serving													

3. Total energy expenditure and requirement.

The total energy requirement of any individual may be obtained by determining the energy expenditure due to internal activities (basal metabolism) and adding to it the energy expenditure due to external activities.

a. Determine your basal metabolism by one or all three of the following methods:

DuBois and DuBois method - based on the surface area of an individual.

(1) Determine your body surface in square meters.[1] Use your body weight in kilograms and your height in centimeters.

Body surface equals _____ square meters.

(2) Determine your hourly basal metabolism by multiplying your surface area by the figure representing your calories per square meter per hour.[2]

Hourly basal metabolism equals _____ calories.

(3) Obtain your basal metabolism for the 24-hour period by multiplying your result from (2) by 24.

Basal metabolism equals _____ calories.

(DuBois and DuBois method)

Harris and Benedict method - based on height and weight alone.

(1) Determine your hourly basal metabolism by adding the appropriate figure in the weight table[3] to the appropriate figure in the age and stature table[4]

Hourly basal metabolism equals _____ calories.

(2) Obtain your basal metabolism for the 24-hour period by multiplying the result in (1) by 24.

Basal metabolism equals _____ calories.

(Harris and Benedict method)

Dreyer method - based on trunk length, weight and chest circumferences.

(1) Secure your calories per hour for your proper weight in kilograms and your age[5]

Calories per hour equal _____.

(2) Obtain your basal metabolism for the 24-hour period by multiplying result in (1) by 24.

(3) Subtract 10 percent of the figure obtained in (2). The figure obtained in (2) represents the basal metabolism of men; the figure for women is 10 percent less.

Basal metabolism equals _____ calories.

(Dreyer method)

Average of all three methods _____ calories.

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[1] H. C. Sherman, Chemistry of Food and Nutrition, 1947, page 172 or 171 or Chaney and Ahlborn, Nutrition, pp. 71-72.

[2] Ibid., page 177, Table 19, or Nutrition, page 73.

[3] M. S. Chaney and M. Ahlborn, Nutrition, page 74, Table 16.

[4] Ibid., page 74, Table 17.

[5] Ibid., page 76, Table 19,

Deductions for sleep

Regardless of which of the above methods is used to determine basal metabolism, it is necessary to make a slight deduction for each hour of sleep to determine one's true basal metabolism. Approximately 0.1 calorie per kilogram of body weight per hour is thought to be saved during sleep.

(1) Multiply your weight in kilograms by 0.1

(2) Multiply the result obtained in (1) by the number of hours spent sleeping.

(3) Subtract the result obtained in (2) from the average figure you obtained for your basal metabolism under a.

Corrected basal metabolism equals _____ calories.

If you happened to have actually obtained your basal metabolism by means of some type of calorimeter, how does the figures so obtained compare with the one above?

b. Determine your energy expenditure during external activities of various kinds.

(1) Record, in Table 18a, all your activities for two typical 24-hour periods from the time of arising one day until the same time the next day.

(2) Using Table 18b, indicate the number of hours spent performing the activities noted or any other activities in which you engaged, obtain the average between the two days, and determine the number of calories expended during each activity.

c. Using Fig. 3, graph the changes which occur in your energy expenditure during one 24-hour period. Use figures in columns 3 and 6 of Table 18a. Indicate on the graph the activities accounting for the changes in your rate of energy expenditure during the day. Show your basal metabolism in red and your sleeping metabolism in green.

TABLE 18a
Record of Daily Activities

Time Record

First Day			Second Day		
Time in hours and minutes	Activity	Calories per kilogram per hour[1]	Time in hours and minutes	Activity	Calories per kilogram per hour[1]

[1] M. S. Rose. A Laboratory Handbook for Dietetics. Fourth edition, page 16, Table III. The Energy Cost of Activities.

TABLE 18b

Record of Daily Activities

Activity Record

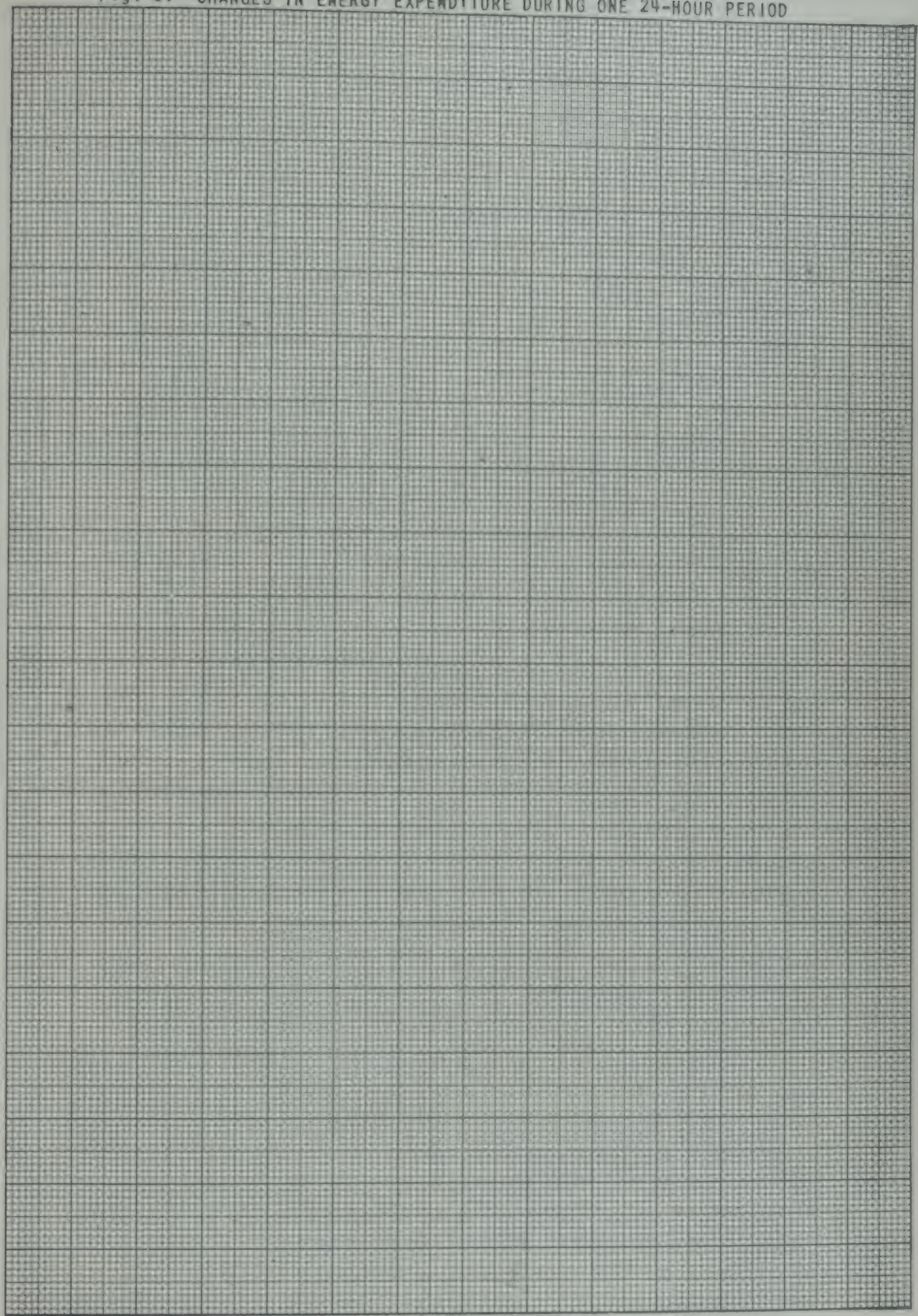
Activity	Number of Hours			Calories per kilogram per hour[1]	Calories per kilogram per period of activity
	1st day	2nd day	Average for 2 days		
Sleeping					
Lying awake					
Dressing and undressing					
Sitting quietly					
Sitting at attention					
Typewriting					
Walking slowly					
Walking moderately fast					
Walking fast					
Running					
Swimming					
Dancing					
Standing					

Total calories per kilogram per day _____

Total calories per student per day _____
(Total calories per kilogram x weight in kilograms)

[1] M. S. Rose. A Laboratory Handbook for Dietetics. Fourth edition, page 16, Table III. The Energy Cost of Activities.

Fig. 3. CHANGES IN ENERGY EXPENDITURE DURING ONE 24-HOUR PERIOD



d. Summarize the preceding data regarding your total energy metabolism.

(1) Basal metabolism _____
(Average of three methods under a)

(2) Deduction for sleep _____

(3) Corrected basal metabolism _____

(4) Total activity expenditure
(Average of two days, Table 18b) _____

(5) Total energy metabolism
(Add items (3) and (4) above) _____

(6) Effect of food
(Add 6 percent of total energy metabolism) _____

(7) Total daily energy output or
Total daily energy requirement or
Total daily number of required calories
(Add (5) and (6) above) } = _____

(8) Energy requirement per kilogram body weight equals
(Divide total daily output by normal body weight in kilograms) _____

How does this last figure obtained compare with standards for a person of your age and activity

4. Calorie Intake.

Calculate the calorie value of each of the foods on the first three day's of your dietary record, Unit One, Problem 3a. Record data in the proper columns of Table 4, and total.[1]

What is your average calorie intake for these three days? Do one-half your calories come from protective foods?	
How does this figure compare with your requirement as determined in Problem 3 of this unit?	
If your caloric intake is less than your requirement, what changes can your suggest in your diet?	
If your weight is normal for your height and age, what relation should your calorie intake bear to your calorie output? Why?	
If you are overweight, what relation should your calorie intake bear to your calorie output? Why?	
If you are underweight, what relation should your calorie intake bear to your calorie output? Why?	

[1] It will be necessary to calculate the protein, mineral, vitamin, fiber, and acid base content of the

TABLE 19

Calorie, Carbohydrate, Protein, and Fat Requirements

	Ht.	Avg. wt.		Cal. per kg.	Total cal.	Carb. gm.	Pro. gm.	Fat gm.
		lb.	kg.					
Man 50 yr.	6'1"							
Woman 42 yr.	5'4"							
Student						Per cent calories		
					Total cal.	from carb.	from pro.	from fat

Protein in Nutrition

Although protein is an important constituent in every living cell in the body, it is found for the most part in active muscle tissue. After water, protein makes up the greatest part of the body tissues.

The body needs specific materials for building and repairing tissues as well as materials to do its work. Bones, blood, muscles, and nerves need to be built and repaired. Protein supplied to the body by food is the important muscle builder and repairer. It is found in a number of foods in varying amounts and forms. It is composed of amino acids, of which twenty-one are now known. Foods which are especially rich in protein are milk, cheese, eggs, meats, legumes, nuts and gelatin. The storage parts of plants, particularly the seeds, are also a source of this nutrient. Milk, cheese, eggs, meat, and some nuts contain complete proteins (those with the right assortment and amount of amino acids essential for growth and maintenance); forms of protein existing in grains, legumes, other vegetables, and gelatin are incomplete (they lack entirely or contain only small amounts of the essential amino acids). Generally, proteins from animal sources are adequate whereas those found in plants are most often inadequate; the incomplete ones of plant origin need to be supplemented in the diet by those of animal origin.

The requirement for protein in the diet during the growing period is large compared with that for the adult, who needs it mainly for replacement and repair. The protein requirements may be estimated in terms of calories. For the adult, 10-15 per cent of the total calories for the day should be derived from these foods; the ration of the growing child should have 15 per cent of the total calories derived from these same foods. Another method is to allow 1 gram of protein per kilogram of body weight for the adult and 2 to 3 grams per kilogram of weight for the growing individual. According to scientific experiments, the total minimum protein requirement of an adult is about 45 grams. Since there is a wide range, however, between this minimum and the amount considered optimum for health, about 1-1/2 to 2 times the minimum figure of 45 grams is the better one. In the adult dietary, protein from animal sources should supply approximately one-half of the daily requirement; in the child's, a higher proportion of protein from animal sources is desirable.

Outline of Unit

A. Protein foods.

1. Chemistry, classification, sources, digestion, and use.

B. Functions of protein in nutrition.

1. Factors determining biological values of the various proteins.
   a. Amino acid make-up of food proteins.
   b. Complete, partially complete and incomplete proteins; dispensable and indispensable amino acids.
2. Building, maintenance, and regulating functions.
3. Factors affecting utilization of protein by the body.

C. Protein balance and requirement.

1. Factors determining the amount of protein required daily.
2. Minimum versus optimum requirements for various age levels and conditions.

3. Methods of stating protein requirement.
4. Means of supplying protein in the diet.
5. Effects of low- and high-protein diets.
6. Relation of muscular work to protein need.

D. Textbook references.

Chaney, M. S., and M. Ahlborn. Nutrition. Chapter V.
Rose, M. S. Foundations of Nutrition. Chapter VIII.
Rose, M. S. A Laboratory Handbook for Dietetics. Pages 3-4; 9; 19-21.
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McCollum, E. V., E. Orent-Keiles, and J. G. Day. Newer Knowledge of Nutrition. Chapters V, VI.
Sherman, H. C., and C. S. Lanford, Essentials of Nutrition. Chapter VI.

E. General references.

Lewis, H. B. "Handbook of Nutrition. II. Proteins in Nutrition." Jour. Am. Med. Assoc.: 120, 198, 1942.
Sherman, H. C. Food and Health. Chapters V, VIII; pages 165-174.
Sherman, H. C. Food Products. Chapters III, IV, V, VI, VII.
U. S. D. A. 1939 Yearbook. Food and Life. Pages 173-186.

F. Supplementary questions for Study and Discussion.

1. How would you define a protein? an amino acid?
2. Explain how protein enters into the composition of all living cells.
   Is protein the only substance which can be classed as a body builder? Explain.
3. Explain the statement, "Protein is an uneconomical source of energy for the body."
4. When is the nitrogen contained in foods an asset? when a liability? Explain.
5. What properties possessed by proteins make them of importance as body regulators? How do proteins act in this capacity?
6. What is meant by a nutritionally essential amino acid? dispensable and indispensable animo acids?
7. How is the minimum amount of protein needed by an individual determined?
   Why is it not possible to determine one's protein requirement by studying the nitrogen (protein) output of a fasting individual? What figure represents the minimum protein requirement?
8. Distinguish between adequate and inadequate proteins. Illustrate, and described experiments to show the differences which exist among proteins.
9. Why is lactalbumin a more efficient protein than casein? Illustrate.
10. How do plant proteins differ from animal proteins? What is meant by the supplementary value of proteins? Illustrate.
11. What factors effect the nutritive value of proteins?
12. Explain nitrogen equilibrium; negative nitrogen balance; positive nitrogen balance. Under what condition does each occur? What interrelationships exist between proteins and enzymes? between proteins and hormones?
13. What percentage of the total calories eaten by an adult should come from food protein? What is the protein requirement per kilogram of body weight for the child and the adult?
14. How does the distribution of protein from the various protein foods compare on moderate- and low-cost diets?

15. Is the quality of protein in the diet of the child of more or less importance than in the diet of the child? Explain.
16. Under what conditions is protein stored in the body?
17. Discuss the relation of muscular activity to protein need.
18. What arguments are advanced against the ingestion of a high-protein diet?
19. Explain why a low-protein diet is likely to be harmful. Who have been the chief exponents of low-protein diet? moderate-protein? high-protein?
20. Compare the functions of proteins with those of carbohydrates and fats.
21. What factor or factors affect most greatly the amount of protein needed in the daily diet? How do these compare with the factor which is the all-important one in energy need?
22. Distinguish between and state the significance of minimum versus optimum amounts of protein.
23. Explain and illustrate what is meant by the supplementary relationship between proteins.
24. Make a chart to show the steps through which protein goes from the time of ingestion to its final use and elimination by the body.

G. Vocabulary of terms to be understood

adrenalin
amino acid
balance experiment
casein
complete protein
cystine
enzyme
glutathione
hemoglobin
histidine
hormone
incomplete protein
insulin
lactalbumin
lysine
negative nitrogen balance
nitrogen equilibrium
nucleoprotein
nutritionally essential amino acid
partially complete protein
phosphoprotein
positive nitrogen balance
proteoses
thyroxine
tryptophane
vitellin

H. Problems.

1. Protein in foods.

a. Compare the protein content of foods by determining the amount of protein in 100 grams of 10-20 protein foods. Record data in Table 20 in descending order of protein value.
b. Determine the weight, measure, and cost of the amount of each food selected in paragraph a, which will furnish 10 grams of protein. Record data in Table 20. Display the foods for discussion.
c. Determine the weight, measure, cost, and number of protein grams in average servings of each of the foods selected in paragraph a. Record data in Table 20. Display the foods for discussion.
d. Study protein equivalents of 1 cup of milk, or 1 egg, or some other food, by determining the amount of each of the foods selected in paragraph a, which will furnish the same number of grams of protein as the milk or the egg or other food. Record data in Table 20. Display the foods for discussion.
e. Show graphically in Fig. 4 the data under a or c.

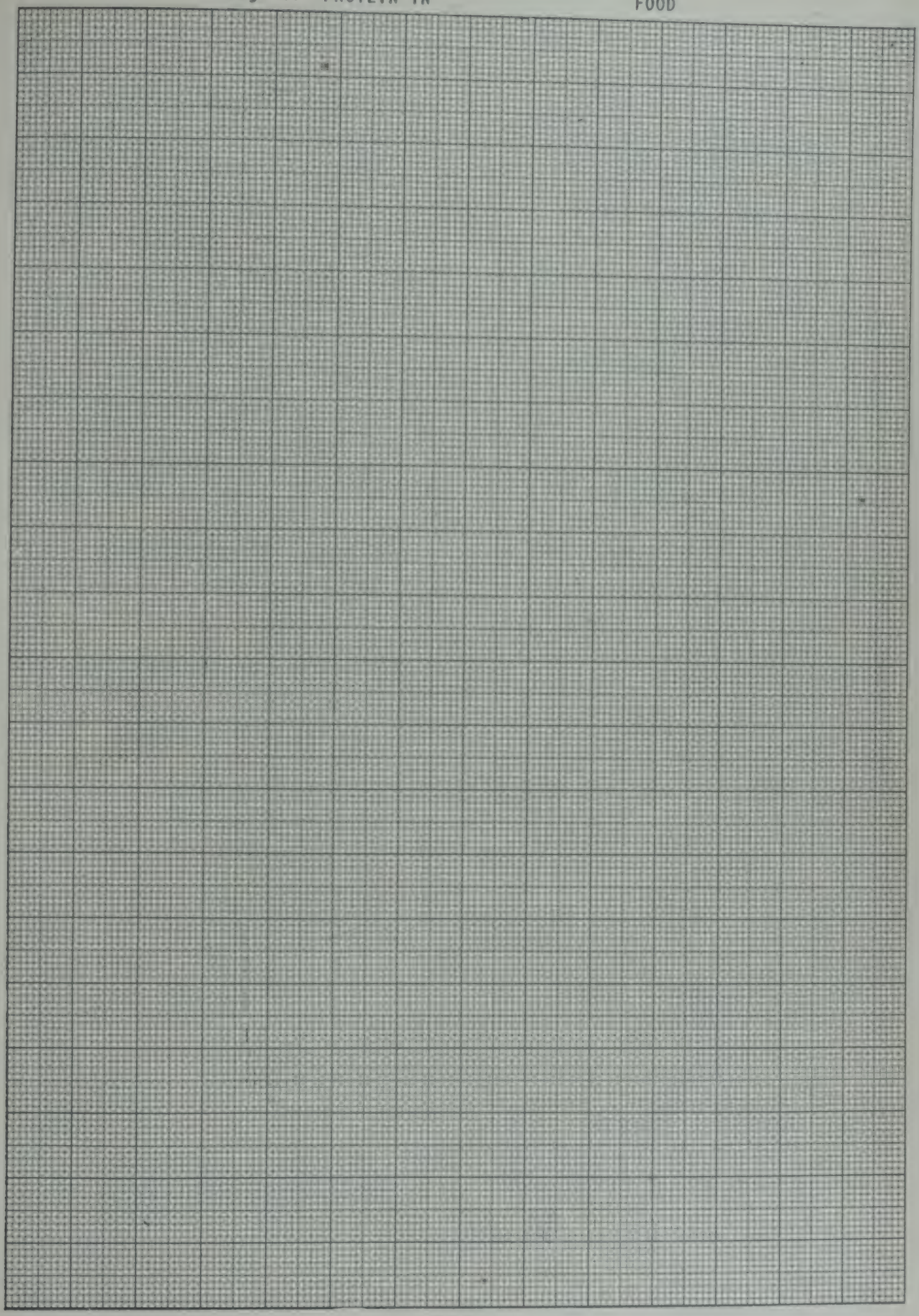
What are the most economical sources of protein in the diet?	
How can the protein requirement be best met on a low- cost diet?	
How can the protein requirement be best met in the event of very strict meat rationing?	

TABLE 20

Protein in Foods

Food	Protein grams in 100 gm.	Furnishes 10 grams			Average serving				Furnishes same amount of protein as		
		Wt. gm.	Meas.	Cost	Wt. gm.	Meas.	Pro. gm.	Cost	Wt. gm.	Meas.	Cost

Fig. 4. PROTEIN IN FOOD



2. Protein requirement.

a. Calculate your own protein requirement on the basis of 10-15 per cent of your total caloric requirement, using the figure you obtained in Problem 3c of Unit Three, Energy.	Minimum protein calories = Optimum protein calories = Minimum protein grams = Optimum protein grams =
b. Calculate your protein requirement on the basis of 1-1½ grams per kilogram of body weight (use your normal weight).	Protein requirement =

3. Protein intake.

a. Calculate the protein value of the first three days of your dietary record; determine the average figure and the percentage from animal sources. If your intake was inadequate, what changes will you suggest in diet?	Average protein intake = Percentage of protein in diet from animal sources = Standard (from animal sources) = Diet changes =
b. Formulate several general rules to follow to insure protein adequacy in the dietary.	

4. Adequate protein in the diet

Plan a day's diet for yourself which will meet your energy and protein needs as calculated (in previous problems) with all protein selected only from dairy products, plant sources and egg (no meat or fish). Tabulate in Table 21.

TABLE 21

Diet Adequate in Energy and Protein without Meat and Fish

Meal	Foods	Wt. gm.	Meas.	Cal.	Protein gm.	Cost
Breakfast						
Lunch or supper						
Dinner						
Totals						

Mineral Elements in Nutrition

Bones, blood, and nerves as well as muscle tissue require certain materials for their construction. Minerals fulfill this function; in addition, they are essential constituents of certain important compounds of the body. Equally as important as their building function is their ability to regulate certain body processes. Nineteen or more chemical elements are found in the body. Five - carbon, hydrogen, oxygen, nitrogen, and sulfur - are furnished by carbohydrates, fats, and proteins. The remaining fourteen are called mineral elements, inorganic foodstuffs, or ash constituents, and they must be supplied by the minerals as such in the diet. They include calcium, phosphorus, iron, iodine, magnesium, sodium, potassium, and chlorine, which are present in the body in measurable amounts, and traces of copper, manganese, zinc, fluorine, silicon, and aluminum. All these minerals are essential for good health, but the functions of some are better known than those of others and the need for some is greater than that for others.

Owing to the wear and tear on the body, minerals are constantly being excreted by way of the intestines and kidneys. As much as 20-30 grams of mineral salts - phosphates, chlorides, and sulfates of potassium, calcium, magnesium, and sodium - may be excreted daily. The daily diet of an adult must contain sufficient minerals to cover this loss and that of a child to allow for storage as well.

Outline of Unit

A. General functions of minerals in nutrition.
   1. Building and regulating functions.

B. Mineral balance and mineral requirements in general.
   1. Methods of determination.
   2. Factors affecting utilization of minerals.

C. The body's need for calcium and phosphorus.
   1. Functions of calcium and phosphorus in nutrition.
   2. Requirements and factors affecting the need at various ages and conditions.
   3. Factors affecting utilization of calcium and phosphorus.
   4. Means of insuring adequate calcium and phosphorus in the diet.
   5. Human and animal experiments and their application.

D. The body's need for iron.
   1. Functions of iron in nutrition.
   2. Requirements and factors affecting the need for iron.
   3. Relation of iron to anemia.
   4. Factors affecting the utilization
      a. Function of copper in iron utilization.
   5. Means of insuring adequate iron in the diet.
      a. Iron content versus iron value of foods.

E. Iodine and iodine metabolism.
   1. Importance of iodine in nutrition.
   2. Relation of iodine to goiter.

3. Iodine balance and requirement.
4. Iodine content of foods.

F. Requirements for other minerals.

1. Additional nutritionally essential minerals and their functions.

G. The effects of cooking processes on minerals in foods.

1. Cooking procedures to insure maximum retention of minerals.

H. Textbook references.

Calcium and phosphorus.

Chaney, M. S., and M. Ahlborn. Nutrition. Chapter VI.
Rose, M. S. Foundations of Nutrition. Chapters IX, X.
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McCollum, E. V., E. Orent-Keiles, and H. G. Day. Newer Knowledge of Nutrition. Chapter VII.

Iron and copper.

Chaney, M. S., and M. Ahlborn. Nutrition. Chapter VII.
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Sherman, H. C. Chemistry of Food and Nutrition. Chapter XV.
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McCollum, E. V., E. Orent-Keiles, and H. G. Day. Newer Knowledge of Nutrition. Chapter IX.

Iodine

Chaney, M. S., and M. Ahlborn. Nutrition. Chapter VIII.
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McCollum, E. V., E. Orent-Keiles, and H. G. Day. Newer Knowledge of Nutrition. Chapter X.

Other Minerals

Rose, M. S. Foundations of Nutrition. Chapter IX.
Sherman, H. C. Chemistry of Food and Nutrition. Chapter XII.
McCollum, E. V., E. Orent-Keiles, and H. G. Day. Newer Knowledge of Nutrition. Chapters VIII, XI.

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J. Supplementary questions for study and discussion.

Calcium and phosphorus

1. In what ways may calcium and phosphorus be said to have a building function in the body? What are the results if these functions are not fulfilled during growth? after growth?
2. In what two forms is calcium present in the bones?
3. What is the effect of an extreme calcium deficit? of a temporary deficit?
4. Does an adult need calcium in his diet? Why?
5. What functions do calcium and phosphorus perform in the blood? in the muscles and nerves?
6. What is meant by a balance experiment for calcium and phosphorus?
7. What is the adult minimum requirement for calcium and phosphorus? the optimum? How much above minimum figures are the optimum figures? How do these figures differ for a child? Why?
8. Why is there more likely to be a deficit of minerals than of proteins in the diet?
9. What convincing evidence could you quote to show the importance of sufficient milk in the diet of the growing child?
10. Discuss the relationship between calcium intake and the amount of calcium in the body? Quote experimental work in answer.
11. Explain how conditions in the blood stream may affect the utilization of calcium and phosphorus; how conditions in the digestive tract may affect their absorption from the intestine.
12. In what two forms are calcium and phosphorus found in the diet? What differences exist in the utilization of either form by the body?
13. What arguments could you advance to try to prove to a skeptical person that milk is the best source of calcium and a good source of phosphorus?
14. Why is the heating of milk thought to influence its calcium and phosphorus content? Is this of importance practically? Why?
15. Why is the calcium content of cheese made from sour milk lower than that of cheese made with rennet?
16. What foods other than milk are good sources of calcium? of phosphorus?
17. Why is it difficult to meet one's daily dietary requirement for calcium if some milk is not included in the diet? May milk ever be omitted entirely from the diet with safety?
18. How many pounds of American or cottage cheese would have to be eaten to supply an adult's total daily calcium requirement?
19. List the do's and don'ts in the cooking and serving of food to insure the maximum calcium and phosphorus retention.
20. Summarize the effects of different methods of cooking on mineral losses in foods.
21. Give evidence to prove the statement, "The American dietary is more likely to be deficient in calcium than in any other element."

22. How may the lack of calcium and phosphorus in the diet of a child be detected? What may be the far-reaching effects of such a lack during childhood?

Iron and copper

1. Where is iron found in the body? How is it related to good nutrition? How does the amount of iron in the body compare with the amount of calcium present?
2. What is meant by the color index of the blood? a high color index? a low color index?
3. How was the minimal requirement for iron arrived at? What is the optimal standard for iron? Does it vary with men and women? Why? Is the usual diet adequate in iron? Why?
4. What foods and in what amounts is it necessary to include in the diet if the optimum standard for iron is to be met?
5. List the do's and don'ts in the cooking and serving of foods to retain the maximum retention of the food iron.
6. "Growth increases the need for iron above the adult optimal requirement." Explain this statement. Under what other conditions is the need for iron greater than the adult optimal requirement?
7. What factors affect the amount of iron required daily?
8. Discuss the various factors which affect the extent to which the body can utilize iron.
9. How was the conclusion reached that copper is essential for the utilization of iron by the body? Explain any other factors which are of importance in iron utilization.
10. Distinguish between nutritional, hemorrhagic, and pernicious anemias. What diet and treatment are advocated for each?

Iodine

1. What are the functions of iodine in nutrition? Where is it found in the body?
2. What determines a natural supply of iodine? What difficulties attend the study of iodine metabolism and need?
3. In what ways is the iodine requirement of children and adults stated?
4. What are the results in the body of a diet lacking in iodine? Why is one person more susceptible to goiter than another?
5. During what periods of life is a goiter due to iodine deficiency most likely to develop? Why?
6. What different methods have been used to treat thyroid gland abnormalities?
7. Distinguish between hypothyroidism and hyperthyroidism; between cretinism and myxedema.

General

1. List minerals other than calcium, phosphorus, and iron which are thought to play some role in nutrition, and state the functions which are ascribed to each.

K. Vocabulary of terms to be understood

anemia
available calcium
available iron
available phosphorus
balance study
calcification
calcium-poor
Ca/P ratio
chlorosis
color index
cretinism
endemic goiter
erythrocyte
exophthalmic goiter
goiter
goitrogenic
hemoglobin
hematopoiesis
hemorrhagic anemia
hyperchromic anemia
hyperthyroidism
hypochromic anemia
hypothyroidism
iodine therapy
macrocytic anemia
margin of safety
mottled enamel
myxedema
nutritional anemia
nutritional goiter
P-A factor
pernicious anemia
reticulocyte
rickets
stroma
tetany
thyroid
thyroxine
trabeculae

L. Problems.

1. Calcium.

TABLE 22

Foods Rich in Calcium[1]

Excellent Sources		Good Sources	
Amaranth	Cress, garden	Almonds	Egg yolk
Broccoli	Dandelion greens	Artichoke	Endive or escarole
Buttermilk	Kale	globe or French	Figs, dry
Cabbage:	Milk, whole or	Beans	Kohlrabi
Savoy and nonheaded	skimmed;	common or kidney	Leeks
Chinese, nonheaded	evaporated, dried,	dry or fresh, shelled	Lettuce, head or leaf
varieties including	condensed	snap or string	Lobster
tendergreens	Molasses	Burdock, roots	Maple sirup
Chard	Mustard greens	Cabbage, headed	Okra
Cheese	Orach	especially green	Oysters
American or Cheddar	Sesame seed	Carrots	Parsnips
Swiss	Tendergreens	Celeriac	Romaine
Clams	Turnip tops	Celery	Rutabagas
Collards	Watercress	Cheese, cottage	Sorgo sirup
		Chickpeas, whole	Soybeans, dry or green
		Chicory, leaves	Soybean flour
		Cottonseed flour	Sweetpotato tops
		Crabs	Turnips
		Cream	Vegetable-oyster or
		Eggs, whole	salsify

a. Compare the calcium content of foods by determining the amount of calcium in 100-gram portions or average servings of 10-20 of the calcium foods listed above. Record data in Table 23 in descending order of calcium value.

b. Show data from paragraph a graphically in Fig. 5.

c. Determine for each of the foods chosen in paragraph a the weight, measure, and cost of the amounts which will furnish 1/10 of the adult daily requirement for calcium. Record data in Table 23. Display these foods for discussion.
In which foods do the average servings yield approximately 1/10 of the daily calcium requirement

d. Study calcium equivalents of 2, 4, or 8 ounces of milk by determining the amount of each of the foods chosen in paragraph a which will furnish the same number of grams of calcium as the amount of milk selected. Record data in Table 23. Display these foods for discussion.

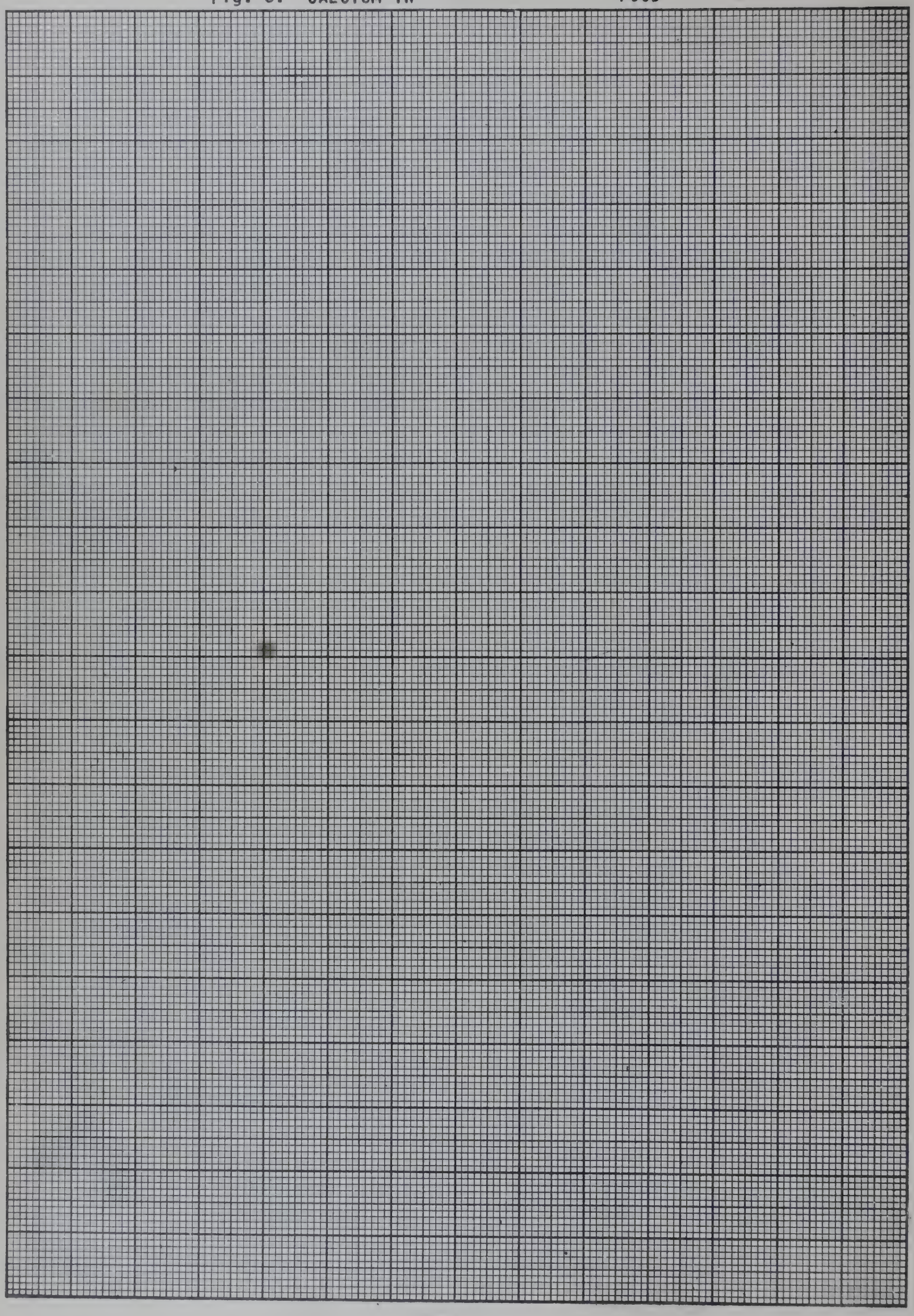
[1]Bureau of Home Economics. Food Composition. Human Nutrition, Reprint of Part 1, U. S. D. A. 1939 Yearbook, page 276. Courtesy of Bureau of Home Economics.

TABLE 23

Calcium in Foods

Food	Calcium grams in 100 gm. or average servings	Furnishes 1/10 the daily calcium requirement			Furnishes the same amount of calcium as in milk		
		Wt. gm.	Meas.	Cost	Wt. gm.	Meas.	Cost

Fig. 5. CALCIUM IN FOOD



2. Phosphorus.

TABLE 24

Foods Rich in Phosphorus[1]

Excellent Sources		Good Sources	
Barley, whole	Meats, lean or medium fat, having more than 12 per cent protein	Almonds	Lentils
Beans		Artichokes	Meats, fats, having more than 6 percent protein
common or kidney		globe or French	
fresh or dry limas		Bamboo shoots	Millets
Brazil nuts	Milk, whole or skimmed; evaporated, condensed, dried	Barley, pearled	Oatmeal or rolled
Buttermilk		Beans, mung, dry	Oats
Cheese, Swiss		Broccoli	Orach
Cottonseed flour	Oysters	Brussels sprouts	Parsnips
Cowpeas, or blackeye peas, shelled	Poultry	Buckwheat flour	Peanuts
Crab	Rice bran	Cashew nuts	Peas
Egg, whole	Rice polish	Celeriac	Pecans
Egg yolk	Sesame seed	Cheese	Pistachio nuts
Fish	Shrimps	American or Cheddar	Rice, brown
Liver, any kind	Soybeans	Cottage	Rye flour
Lobster	Soybean flour	Chickpeas	Walnuts
		Clams	Wheat:
		Cocoa	Flour, graham or whole wheat
		Collards	Shredded or puffed
		Corn, green sweet	Whole grain or meal
		Cornmeal, whole ground	Bran
		Cress, garden	Germ
		Dasheen or taro	
		Hazelnuts and filberts	
		Kohlrabi	

a. Compare the phosphorus content of foods by determining the amount of phosphorus in 100-gram portions or average servings of 10-20 of the phosphorus rich foods listed above. Record data in Table 25 in descending order of phosphorus value.

b. Show data from paragraph a graphically in Fig. 6.

c. Determine for each of the foods chosen in paragraph a the weight, measure, and cost of the amounts which will furnish 1/10 of the adult daily requirement for phosphorus. Record data in Table 25. Display the foods for discussion.

In which of the foods do the average servings yield approximately 1/10 of the daily phosphorus requirement?

d. Study phosphorus equivalents of 2 or 4 or 8 ounces of milk or some other food by determining the amount of each food chosen in paragraph a which will furnish the same number of grams of phosphorus as the amount of milk or other food selected. Record data in Table 25.

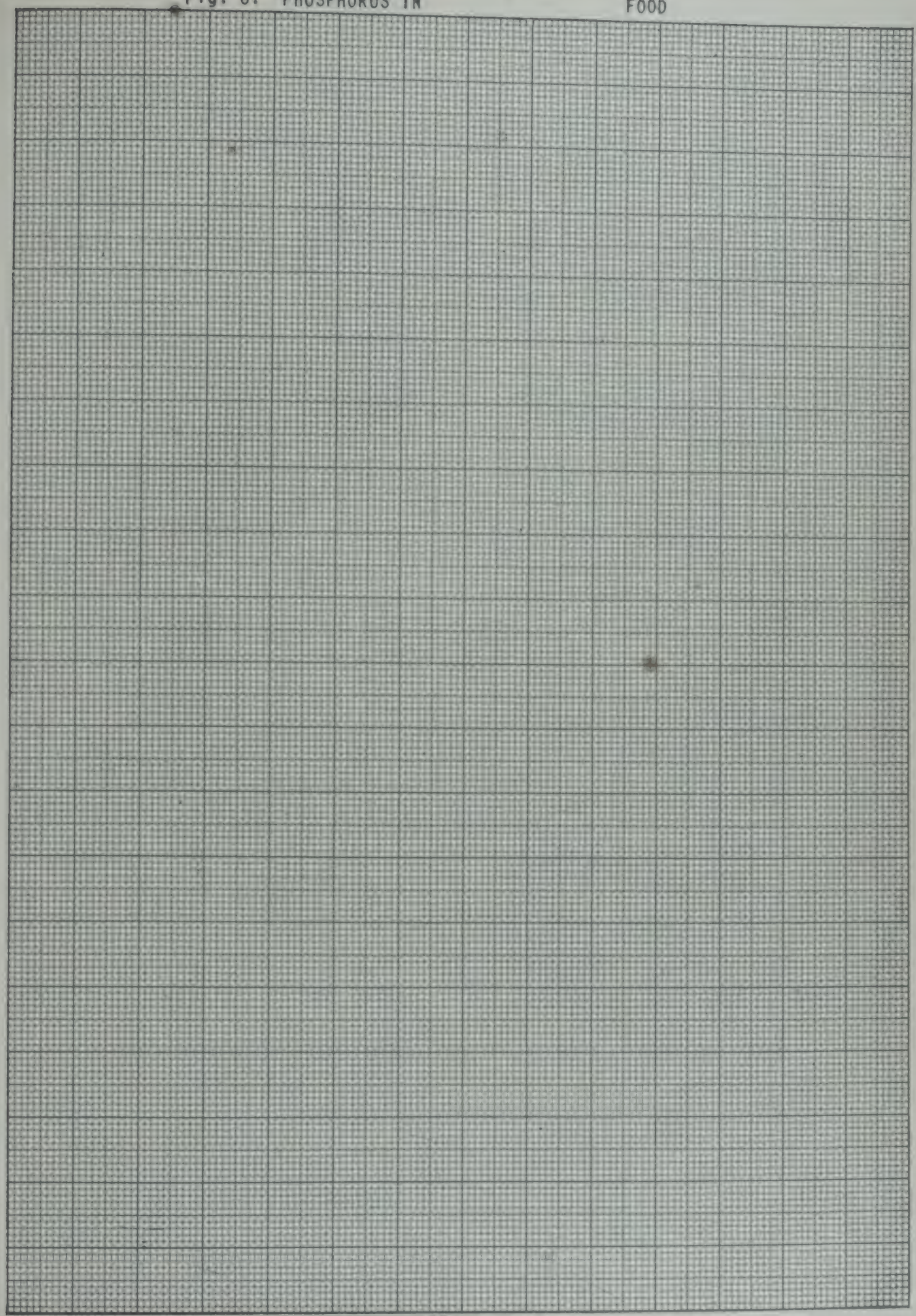
[1]Bureau of Home Economics. Food Composition. Human Nutrition. Reprint of Part 1, U. S. D. A. 1939 Yearbook, page 277. Courtesy of Bureau of Home Economics.

TABLE 25

Phosphorus in Foods

Food	Phosphorus grams in 100 gm. or average serving	Furnishes 1/10 the daily phosphorus requirement			Furnishes the same amount of phosphorus as		
		Wt. gm.	Meas.	Cost	Wt. gm.	Meas.	Cost

Fig. 6. PHOSPHORUS IN FOOD



3. Summary of problems 1 and 2. Which foods in Tables 23 and 25 are good sources of both calcium and phosphorus?	
What other foods supply calcium in appreciable amounts?	
What additional foods supply phosphorus in appreciable amounts?	
How may calcium and phosphorus be best and most economically supplied on low cost diets?	

4. Diet plan for calcium and phosphorus.

   a. Using average servings of foods and keeping in mind the foods suggested by "The Basic Seven," pages 9 and 10, outline on Table 27 three <u>different</u> ways to insure the inclusion of sufficient calcium and phosphorus in the diet. In the first plan use one pint of milk plus the other foods; in the second, use 1/2 the amount of milk plus other foods; in the third, 1/4 the amount of milk plus other foods.

      What conclusions can you draw from this study?

TABLE 26

Diet Plans for Insuring Sufficient Calcium and Phosphorus in the Diet

Food	Wt. gm.	Meas.	Ca gm.	P gm.	Calories	Cost
Plan 1						
Totals						
Plan 2						
Totals						
Plan 3						
Totals						

5. Iron.

TABLE 27

Foods Rich in Iron[1]

Excellent Sources		Good Sources	
Apricots, dried	Meats, lean or medium fat (beef, veal, pork, or lamb), over 15 per cent protein	Barley, whole	Oatmeal or rolled oats
Beans		Beans, snap or string	
Common or kidney shelled		Brains	Peas, green or dried, whole seeds
Lima, shelled fresh or dry	Molasses	Broccoli	
Beet greens	Mustard greens	Brussels sprouts	Poultry, light meat
Broccoli leaves	New Zealand spinach	Cabbage greens or outer leaves	Prunes, dried
Chard	Oysters	Collards	Rye flour, whole
Cowpeas, shelled fresh or dry	Peaches, dried	Cornmeal, whole ground	Seedless raisins, or "currants"
Dandelion	Poultry, especially dark meat	Dates	Sugarcane sirup
Eggs, whole	Shrimps	Dock or sorrel	Vegetable-oyster or salsify
Egg yolks	Sorgo sirup	Endive or escarole	Whole-wheat cereals
Heart	Soybeans, dry or as green vegetable	Figs, dried	Whole-wheat flour
Kale	Spinach	Leaf lettuce	
Kidney	Tongue	Meats, fat (beef, veal, pork, or lamb), over 10 per cent protein	
Lentils, dry	Turnip greens		
Liver	Water cress		
	Wheat bran		

a. Compare the iron content of foods by determining the amount of iron in 100-gram portions or average servings of 10-20 of the iron-rich foods listed above. Record data in Table 28 in descending order of iron value.

b. Show the date from paragraph a graphically in Fig. 7.

c. Determine for each of the foods chosen in paragraph a the weight, measure, and cost of the amounts which will furnish 1/10 of the adult daily requirement for iron. Record data in Table 28. Display the foods for discussion.

In which of the foods do the average servings yield approximately 1/10 of the adult daily iron requirement?

d. Study iron equivalents of 1 egg or 4 ounces of liver by determining the amount of each of the foods chosen in paragraph a which will furnish the same number of grams or milligrams of iron as the amount of foods selected. Record data in Table 28. Display the foods for discussion.

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[1]Bureau of Home Economics. Food Composition. Human Nutrition. Reprint of Part 1, U.S.D.A. 1939 Yearbook, page 278. Courtesy of Bureau of Home Economics.

Fig. 7. IRON IN FOOD

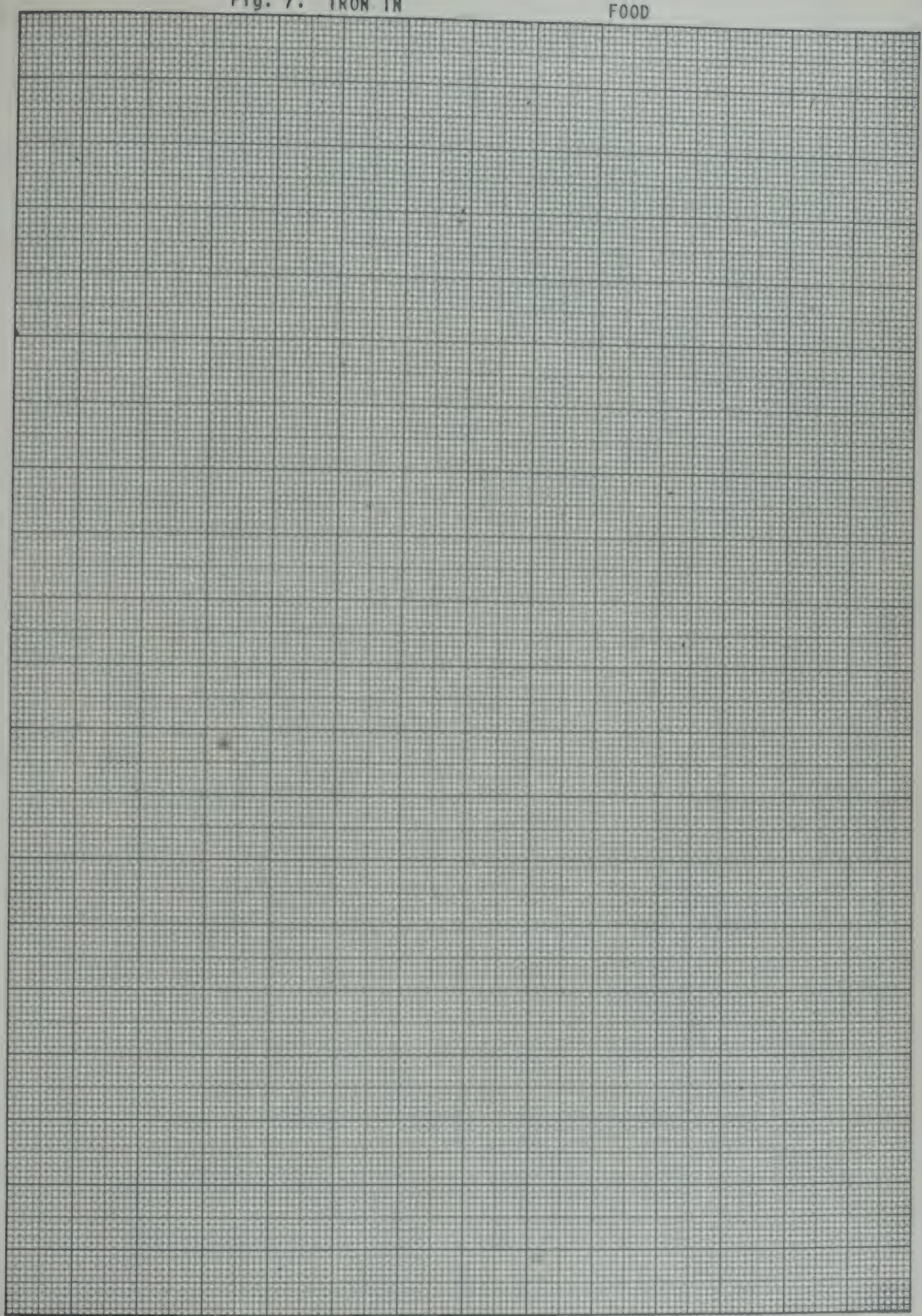

TABLE 28

Iron in Foods

Food	Iron milligrams in 100 gm. or average serving	Furnishes 1/10 the daily iron requirement			Furnishes the same amount of iron as		
		Wt. gm.	Meas.	Cost	Wt. gm.	Meas.	Cost

6. Diet plans for iron.

   a. Using average servings of foods and keeping in mind the food suggested by "The Basic Seven," pages 9 and 10, outline in Table 23 three <u>different</u> ways to insure the inclusion of sufficient iron in the daily diet. In the first plan include meat and egg; in the second, egg but no meat; in the third plan, neither meat nor egg.

   What conclusions can you draw from this problem?

TABLE 29

Diet Plans for Insuring Sufficient Iron in the Diet

Food	Wt. gm.	Meas.	Fe mg.	Calories	Cost
Plan 1					
Totals					
Plan 2					
Totals					
Plan 3					
Totals					

7. Mineral requirements. What are your daily requirements for calcium, phosphorus and iron?	Ca requirement - gm. Phos requirement - gm. Fe requirement - mg.
8. Mineral intake. Calculate the calcium, phosphorus and iron content of each of the first three days of your dietary record. What is your average intake for calcium, phosphorus and iron?	Average Ca intake - gm. Average Phos intake - gm. Average Fe intake - mg.
If your intake was inadequate for your requirements, what suggestions can you make for improving the mineral content of your diet?	
Formulate some general rules to follow in the selection, preparation for cooking and the serving of foods which will insure an adequate amount of calcium, phosphorus and iron in the daily diet.	Selection Preparation Serving
How may iron best be supplied on low-cost diets?	

Vitamins in Nutrition

Vitamins are the newest comers to the list of nutrients now known to be required daily by the body. The term vitamin was coined about twenty-five years ago for certain nutritional substances which were beginning to appear essential in addition to the already known proteins, fats, carbohydrates, and mineral salts. As each new vitamin was recognized, an alphabetical designation was given, five letters being used originally. This list has gradually been extended as other vitamins have been discovered, and some of the original letters have been subdivided to indicate the several parts of certain vitamins.

The isolation, the determination of the formula and chemistry, and, in some instances, the synthesis of each of these substances have brought the realization that each vitamin is a distant chemical entity and nutritional essential. The term vitamin is, therefore, no longer suitable as a group name. Names indicating chemical nature are now replacing the alphabetical designation of the vitamins.

Because vitamins have been found to be necessary for growing organisms, to prevent certain diseases, to insure optimal conditions of health, and to promote reproduction and lactation, they are classed as body regulators. All vitamins have these general functions, but each one has also a specific part to play in nutrition. Formerly they were judged only by their effects and manifestations in experimental work with animals; now their chemistry is the interest of the chemist, and their effects in bettering human health are the interest of the nutritionist, physician, and clinician alike.

Present-day vitamin investigators recognize some fifteen to eighteen vitamins. As a matter of convenience, these may be grouped according to their solubility in fat or water. Fat-soluble vitamins include: vitamin A, of which two forms, A_1 and A_2 are now known, and the precursors of vitamin A; vitamins D, D_2 being activated ergosterol and D_3 activated 7-dehydrocholesterol; vitamin E or alpha- and beta-tocopherols; and vitamins K_1 and K_2.

Water-soluble vitamins include members of the B complex group, ascorbic acid, citrin (vitamin P), grass juice factor, and milk factor. Twelve separate factors are recognized in the B complex group, the following nine of which have been obtained in crystalline form; thiamin (B_1), riboflavin (B_2), nicotinic acid (now called niacin), pyridoxine (B_6), pantothenic acid, choline, biotin, inositol, para-aminobenzoic acid.

The nutritional significance in human nutrition of vitamins A, D, and K from the fat-soluble group, and of ascorbic acid, thiamin, riboflavin, and nicotinic acid from the water-soluble group, is well established. Further research is necessary before final conclusions as to the role of vitamin E for the human can be made. Conflicting evidence is reported regarding the importance in human nutrition of several water-soluble vitamins, other than thiamin, riboflavin, nicotinic acid, and ascorbic acid. Some vitamins appear to be important for nutrition of one species and not another. Only those vitamins which have well-recognized significance in human nutrition and which must be planned for in the daily diet are covered in this unit.

Outline of Unit

A. Discovery of vitamins as nutritional essentials.

B. General functions of vitamins in nutrition.

C. Requirements and methods of stating requirements for vitamins.

D. Fat-soluble vitamins.

1. Vitamins A, D, E, and K.

a. Nature and chemistry.
b. Biological, chemical, and clinical methods of determination.
c. Biological and International Units.
d. General and specific functions in nutrition.
e. Human requirements at various age and condition levels.
f. Food sources.

E. Water-soluble vitamins.

1. Vitamins of the B complex - thiamin, riboflavin, and nicotinic acid.

a. Nature and chemistry.
b. Biological, chemical, and clinical methods of determination.
c. Biological and International Units.
d. General and specific functions in nutrition.
e. Human requirements at various age and condition levels.
f. Food sources.

2. Ascorbic acid.

a. Nature and chemistry.
b. Biological, chemical, and clinical methods of determination.
c. Biological and International Units.
d. General and specific functions in nutrition.
e. Human requirements at various age and condition levels.
f. Food sources.

F. Other vitamins and related factors and their possible significance in nutrition.

G. Relation of vitamins to hormones and enzymes.

H. Factors affecting the vitamin content of foods and their utilization by the body.

I. Vitamin fortification of food.

J. Synthetic preparations of vitamins.

K. Textbook references.

Vitamin A and carotene

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Rose, M. S.. Foundations of Nutrition. Chapter X.
Sherman, H. C. Chemistry of Food and Nutrition. Chapter XXII.
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Vitamin D

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Sherman, H. C. Chemistry of Food and Nutrition. Chapter XXIII.
Sherman, H. C., and C. S. Lanford. Essentials of Nutrition. Chapter XVI.
McCollum, E. V., E. Orent-Keiles, and H. G. Day. Newer Knowledge of Nutrition. Chapters XIV, XV.

Vitamin E

Chaney, M. S., and M. Ahlborn. Nutrition. Page 168.
Rose, M. S. Foundations of Nutrition. Chapter XVIII.
Sherman, H. C. Chemistry of Food and Nutrition. Chapter XXIV.
Sherman, H. C., and C. S. Lanford. Essentials of Nutrition. Chapter XVII.
McCollum, E. V., E. Orent-Keiles, and H. G. Day. Newer Knowledge of Nutrition. Chapter XXIII.

Vitamin K

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Smith, H. P., et al. "Clinical and Experimental Studies on Vitamin K." Jour. Am. Med. Assoc.: 113, 313, 1939.
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Ansbacher, S., "A Quantitative Biological Assay of Vitamin K." Jour. Nutrition: 17, 303, 1939.

Thiamin

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Rose, M. S. Foundations of Nutrition. Chapter XI.
Sherman, H. C. Chemistry of Food and Nutrition. Chapter XIII.
Sherman, H. C., and C. S. Lanford. Essentials of Nutrition. Chapter XII.
McCollum, E. V., E. Orent-Keiles, and H. G. Day. Newer Knowledge of Nutrition. Chapters XVIII, XIX.

Riboflavin

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Nicotinic acid

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Ascorbic acid

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McCollum, E. V., E. Orent-Keiles, and H. G. Day. Newer Knowledge of Nutrition. Chapters XVI, XVII.

Other vitamin factors

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M. Supplementary questions for study and discussion.

Vitamin A and carotene

1. How did the discovery of vitamins come about? Why were these important nutritional essentials undetected for such a long period?
2. Why are white rats used so extensively for purposes of nutrition investigation and especially for vitamin study? What other animals are used for vitamin study?
3. What is known regarding the chemistry of vitamin A? the forms?
4. What is meant by a vitamin precursor? What are the precursors of vitamin A? How do they differ? What is the relative significance of each?
5. How was the relationship between carotene and vitamin A proved? What part does the liver play in this relationship? How is the vitamin A value of green vegetables explained?
6. Will xanthophyll act in the same way as carotene? How can vitamin A be distinguished from carotene?
7. Describe the biological method which is used to determine the vitamin A value of any food. What is the basis of this test?
8. What chemical and spectometric tests are available for determining the vitamin A value of foods? What is the basis of each of these tests?
9. What methods are now available to determine vitamin A adequacy clinically? Describe the principles involved in each of the types of apparatus used for this purpose.
10. How is vitamin A related to the ability of one's eyes to adapt to variations in the degree of intensity of light to which the eyes are exposed?
11. Difficulties in night automobile driving are now being associated with vitamin A shortage in the diet. How can this be explained? What is meant by "latent" xerophthalmia?
12. What proof exists for the fact that vitamin A is necessary for growth? Is this the only growth-promoting dietary essential? Explain.

13. In what ways does vitamin A bring about good functioning of the respiratory and alimentary tracts and certain glands?
14. What parts of the body other than those mentioned above are thought to depend for their proper functioning upon the presence in the diet of vitamin A? How does the vitamin act in each case? What other functions are attributed to vitamin A?
15. What is the present status of the question whether vitamin A can be termed an anti-infective vitamin?
16. Is carotene or vitamin A used more efficiently by the human organism? What factors determine the complete utilization of carotene? of vitamin A?
17. What is the optimum daily requirement for vitamin A for the child, for the adult, and during pregnancy? What factors affect the requirement in each case? How is the requirement stated?
18. Distinguish between a Sherman and an International unit of vitamin A. What relation do they bear to each other?
19. What are the richest sources of vitamin A? How do these compare in relative potency? What does U. S. P. cod-liver oil mean?
20. What natural food sources contain significant amounts of vitamin A? What plant sources possess vitamin A value? How is this A value explained?
21. Tabulate the sources of vitamin A under excellent, good, and fair.
22. Discuss the properties of vitamin A in plant and animal sources. Of what importance are these properties from the standpoint of cooking vitamin A foods?

Vitamin D

1. What are the two important precursors of vitamin D? Where is each found? By what means is their conversion to vitamin D brought about?
2. Identify calciferol; viosterol; toxisterol. Can any of these substances be substituted for cod-liver oil?
3. Explain the method by which vitamin D is thought to aid in the utilization of calcium and phosphorous. Upon what factors is the proper functioning of vitamin D dependent?
4. What are the causes of rickets? What are the clinical symptoms of this disease? the X-ray symptoms? blood analysis sumptoms?
5. Cite experiments and observations to show that vitamin D is an important factor in linear growth; in the proper formation of the teeth?
6. Vitamin D is thought to be a nutritional essential throughout one's entire life. Explain the several reasons why this statement might be true. What are the far-reaching effects of shortages of this vitamin in early life?
7. Explain why ultra-violet light is as effective as vitamin D in curing rickets. What conditions interfere with its activating properties? Why are artificial sources of ultra-violet light more effective than natural source? What sources of artificial ultra-violet light are available? Is it correct to speak of a sunshine vitamin? Why?
9. What characteristics must foods possess in order to be endowed with vitamin D potency? What stand has been taken by the American Medical Association on the question of the irradiation of foods?
10. What methods are in use for increasing the vitamin D in milk? What is the unit content per quart for each kind of milk? Why is the vitamin D in milk thought to be particularly effective? Is each type of vitamin D milk equally effective?

11. Explain the technique involved in the line test for the determination of the vitamin D content of a food.
12. What tests are used to determine the effects of vitamin D in humans?
13. Distinguish between a Steenbock and an International unit of vitamin D. What is the relationship of the two?
14. Cite various experiments and authorities which give some evidence of the need of humans of different ages for vitamin D. What evidence exists for and against the possibility of excessive amounts of the vitamin? How is the vitamin D requirement stated?
15. Summarize the existing information regarding the vitamin D content of natural foods.
16. What is known of the relative efficiency of vitamin D from various sources for different species?
17. How does vitamin D compare with vitamin A in stability to adverse conditions? What part of the fat molecule carries vitamin D potency? Is the same true of vitamin A?
18. What does U. S. P. cod liver oil indicate as to its vitamin D value? What other fish oils are good sources of vitamin D?
19. How may adequate vitamin D be assured during childhood? for the average adult? during pregnancy and lactation?

Thiamin (vitamin B_1)

1. What observations led up to the discovery that the substance now known as thiamin is necessary in the diet?
2. What is known regarding the chemistry and chemical and physical properties of vitamin B_1? What particular properties of this vitamin are of especial importance in food preparation? Why? Has vitamin B_1 been successfully isolated and produced synthetically?
3. Distinguish between a Sherman-Chase unit and an International unit of B_1. How is each determined? What is the relation of one to the other? What method of expressing vitamin potency has been suggested in place of the unit for B_1? Which method is used more commonly to-day?
4. What methods other than the biological method are used for assaying foods for B_1?
5. How does vitamin B_1 function in normal nutrition for growth? in metabolism? in the digestive and nervous systems?
6. Tabulate the sources of vitamin B under excellent, good and fair. How do animal sources compare with plant sources? What is the explanation for this?
7. What is Cowgill's formula for determining the vitamin B_1 needs of man? What is the basis for this formula?
8. How may the vitamin B_1 requirement for children be obtained? for adults? What is the estimated requirement for a child per day? for an adult? Why is it necessary to be sure that some sources of vitamin B_1 is included in the diet every day?
9. Under what conditions is the need for vitamin B_1 increased?
10. How is the vitamin B_1 requirement usually stated? Why?
11. Tabulate the requirements of B_1 for different ages and conditions as given by various authorities.
12. How is it practically possible to retain the vitamin B_1 of foods during the cooking processes?
13. How can an adequate amount of thiamin be assured in the diet in the event of very strict meat rationing?

Riboflavin (vitamin G)

1. What observations led up to the discovery that the substance early identified as vitamin B was multiple in nature?
2. What are the chemical and physical properties of riboflavin? Are these the same as for thiamin? Which of the methods suggested to insure the thiamin content of foods during cooking apply also to the cooking of foods containing riboflavin?
3. What is the most outstanding function of riboflavin? What other functions have been attributed to this vitamin? What are the symptoms which indicate a lack of riboflavin in the diet of humans?
4. Distinguish between the Sherman-Bourquin and Aykroyd and Roscoe vitamin G units. How is each obtained? What is the equivalent of each in synthetic riboflavin? Has an International Unit for vitamin G been established?
5. What foods are good sources of vitamin G? Do these same foods contain comparable amounts of vitamin B_1? Which foods providing both G and B_1 contain more of the latlater than the former?
6. To what factor is the requirement for vitamin G thought to be related? What optimum standard has been set for vitamin G intake in children and adults? What is the present-day preferred method of stating this requirement?
7. How may the adequacy of vitamin G in the diet be determined? How does the storage of vitamin G in various parts of the body compare with the storage of vitamin A?

Vitamins and pellagra

1. What have been the developments in the discovery that nicotinic acid and not vitamin G or riboflavin is the pellagra-preventing factor?
2. What is known about the chemistry of nicotinic acid? In what foods is this substance found? How may its presence be detected?
3. What amount of nicotinic acid has been suggested as a supplement to a well balanced diet in the treatment of pellagra?
4. What relation is riboflavin thought to have in the metabolism of nicotinic acid?
5. What is Sebrell's daily diet in the treatment of pellagra? What foods (and in what amounts) are suggested by Sherman as meeting the daily requirement for nicotinic acid?

Ascorbic Acid (vitamin C)

1. When, by whom, from what, and in what form was vitamin C isolated?
2. What is known regarding the chemistry of vitamin C? What are its physical and chemical properties? What factor is most important in the destruction of vitamin C during cooking? What procedure should be followed in food preparation to insure the maximum retention of vitamin C?
3. How does vitamin C function in intercellular materials? What are included under this term? What are the results when vitamin C is lacking in the diet?
4. What is meant by "latent" scurvy? Of what significance is it? Do all species of animals need vitamin C? Explain.
5. What evidence exists to demonstate that vitamin C aids in increasing resistance to disease?
6. What three methods are in use for determining the amount of vitamin C in a food? What names are applied to each? Upon what is each based?
7. In what three ways may the vitamin C potency of a food be expressed?

8. Distinguish between a Sherman and an International Unit of vitamin C. How is each determined What relation do they bear to each other?
9. Explain the three methods which are available to determine how much vitamin C is required by a human. What are the advantages and disadvantages of each?
10. What are the best natural food sources of vitamin C? What factors determine the amount of vitamin C in a food will contain? Give examples of each.
11. What therapeutic dosage of vitamin C has been suggested for infants and adults? What optimum standard has been set for adults? What factors affect the absorption and utilization of vitamin C? Under what conditions are the requirements for vitamin C increased? What is the accepted way of expressing vitamin C requirement?

Other vitamins

1. What is the present status of our knowledge regarding human requirements for vitamin E? for vitamin K? for vitamin B_6? for pyridoxine? for choline?

N. Vocabulary of terms to be understood:

ascorbic acid
atrophy
avitaminosis
beriberi
beta-carotene
biological unit
biotin
calciferol
capillary resistance
carotene
cevitamic acid
cheilitis
cheilosis
chlorophyll
choline
clinical test
cocarboxylase
columnar epithelium
cornification
cryptoxanthin
dentine
dehydroascorbic acid
dehydrocholesterol
enamel
ergosterol
epithelial
fortified vitamin D milk
gamma-carotene
hemeralopia
hypoprothrombinemia
international unit
intercellular material
irradiated milk
irradiation
keratinization
latent vitamin deficiency
metabolized D milk
metaplasia
multiple deficiency disease
niacin
nicotinic acid
night blindness
nyctalopia
odontoblast
osteomalacia
oleum percomorphum
pellagra
precursor
prothrombin
polyneuritis
riboflavin
rickets
rhodopsin
scurvy
stratified epithelium
suprasterol
sterols
thiamin
toxisterol
ultra-violet ray
viosterol
visual purple
xerophthalmia

Note

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O. Problems.

1. Vitamin A and carotene.

TABLE 30

Food Sources of Vitamin A and Provitamin A[1]

Type of Food	Excellent Sources		Good Sources	
Animal Products	Butter	Fish-liver oils	Cream	Oysters
	Cheese	Fish roe	Kidney	Red salmon
	Egg Yolk	Liver	Milk, whole	
Vegetables	Beans, green	Lamb's-quarters	Artichokes, globe	
	Beet greens	Lettuce, green	Asparagus, green	
	Broccoli	Mustard greens	Brussels sprouts	
	Carrots	Peas, green	Okra	
	Chard	Peppers, sweet	Tomatoes, yellow	
	Chinese cabbage	Spinach		
	Collards	Squash, yellow		
	Dandelion greens	Sweet potatoes		
	Dock	Tomatoes, red		
	Escarole	Turnip tops		
	Kale	Watercress		
Fruits	Apricots		Avocados	Dates
	Mangoes		Bananas	Guavas
	Papayas		Blackberries	Olives, green or ripe
	Peaches, yellow		Black currants	
	Prunes		Blackberries	Oranges, deep yellow juice
			Cantaloup	
Cereal			Cornmeal, yellow	

a. Compare foods with vitamin A value by determining the number of vitamin units or carotene value in 100-gram portions of 10-20 of the vitamin A-rich foods listed above. Record data in Table 31 in descending order of vitamin A value.[2]

b. Determine for each of the foods chosen in paragraph a the weight, measure, and cost of the amount of each food which will furnish 1/10 of the adult daily requirement for vitamin A.[3] Record data in Table 31. Display the foods for discussion.

c. Determine the weight, measure, cost, and number of vitamin A units in the average servings of each of the foods chosen in paragraph a. Record data in Table 31.

d. Show data from a or c graphically in Fig. 8.

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[1]Bureau of Home Economics. Vitamin Content of Foods. Human Nutrition. Reprint of Part 1, U. S. D. A. 1939 Yearbook, page 288. Courtesy of Bureau of Home Economics.

[2]Use International Units (1 Sherman unit equals 0.7 International Unit).

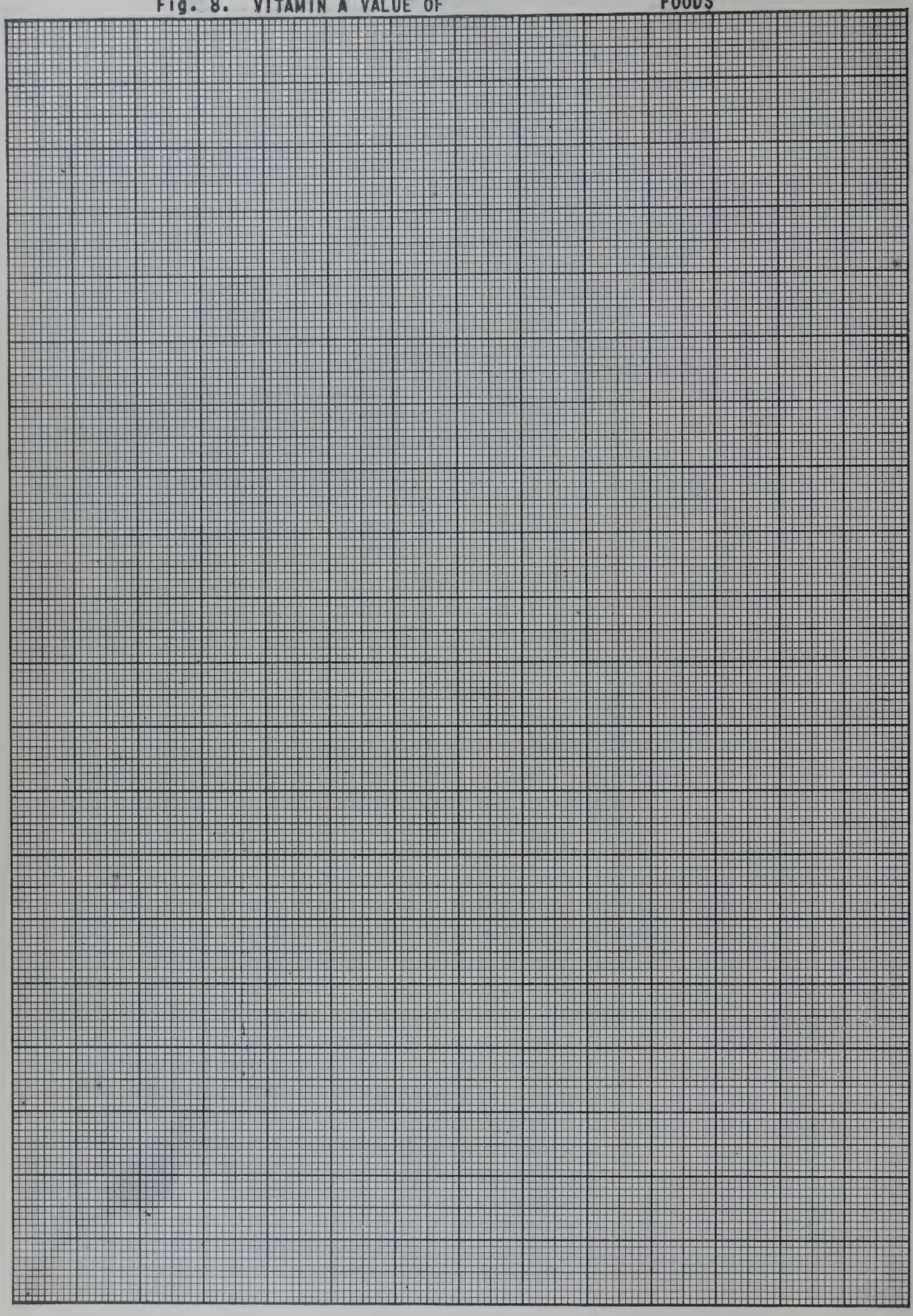
[3]Requirements for vitamin A, see Table 1.

TABLE 31

Vitamin A in Foods

Food	International Unite of Vitamin A in 100 gm.	Furnishes 1/10 daily vitamin A requirement			Average serving			
		Wt.gm.	Meas.	Cost	Wt.gm.	Meas.	Vitamin A I.U.	Cost

Fig. 8. VITAMIN A VALUE OF FOODS



e. Study the vitamin A equivalents of 1/2 or 1 cup of milk, 1 T. of butter, or other vitamin A food by determining the amount of each of the foods selected in paragraph a which will furnish the same number of vitamin A units as contained in the food chosen. Display for discussion. Record data in Table 32.

TABLE 32

Vitamin A Equivalents of

Food	Wt. gm.	Meas.	Cost

2. Vitamin D.

TABLE 33

Sources of Vitamin D[1]

Type of Food	Excellent Sources	Good Sources	Small Amounts
Animal products	Egg yolk from hens on a diet high in vitamin D	Butter	Cream
		Eggs	Liver
		Salmon	Milk, whole
	Fish-liver oils	Sardines	Oysters
	Foods enriched with vitamin D by the Steenbock process of irradiation with ultra-violet light.		

a. Compare the vitamin D content of foods by determining the amount of vitamin D in several or all of the foods listed above as well as in some commercially D enriched products. Record these data, and show graphically in Fig. 9, listing foods in descending order of vitamin D value.

Fig. 9. International Units of Vitamin D in 100-Gram Portions

Food	Meas.	Vitamin D I.U.

[1]Bureau of Home Economics. Vitamin Content of Foods, Human Nutrition. Reprint of Part 1, U. S. D. A. 1939 Yearbook, page 288. Courtesy of Bureau of Home Economics.

3. Thiamin.

TABLE 34

Food Sources of Thiamin[1]

Type of Food	Excellent Sources	Good Sources	Fair Sources
Animal products	Chicken Kidney Liver Pork, lean	Beef, lean Brains Codfish Egg yolk Fish roe Mutton, lean Sardines Whiting	Milk, fresh whole or skim
Vegetables	Beans, green lima	Beans, wax and green Beets Brussels sprouts Cabbage Cauliflower Collards Garden cress Kale Leeks Lettuce Mushrooms Onions Parsnips Potatoes Sweet corn Sweet potatoes Tomatoes Turnip greens Spinach Watercress	Broccoli Eggplant Kohlrabi Turnips
Fruits		Apples Avocados Cantaloup Dates Figs Grapefruit Oranges Pears Pineapple Plums Prunes Tangerines	Bananas Blackberries Raspberries
Seeds	Barley Beans, navy Corn germ Cowpeas Oats Peanuts Pear, dried Rice, brown Rice polishings Rye Rye germ Soybeans Wheat bran Wheat germ Wheat	Almonds Brazil nuts Chestnuts Hazelnuts Pecans Walnuts	

[1]Bureau of Home Economics. Vitamin Content of Foods. Human Nutrition. Reprint of Part 1, U. S. D. A. 1939 Yearbook, page 290. Courtesy of Bureau of Home Economics.

a. Compare foods containing thiamin by determining the number of milligrams of thiamin in 100-gram portions of 10-20 of the thiamin foods listed above. Record data in Table 35 in descending order of thiamin value.[1]

b. Determine for each of the foods chosen in paragraph a the weight, measure, and cost of the amount of each which will furnish 1/10 of the adult daily requirement for thiamin.[2] Record data in Table 35. Display the foods for discussion.

c. Determine the weight, measure, cost, and number of milligrams of thiamin in the average servings of each of the foods chosen in paragraph a. Record data in Table 35.

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[1]International Units may be used although preference is given to the method of stating thiamin value in milligrams. 1 International Unit of thiamin = 3 micrograms; 1 mg. thiamin = 333 I.U.

[2]Requirements for thiamin, see Table 1.

TABLE 35

Thiamin in Foods

Food	Thiamin mg. in 100 gm.	Furnishes 1/10 daily thiamin requirement			Average serving			
		Wt.gm.	Meas.	Cost	Wt.gm.	Meas.	Thiamin mg.	Cost

d. Study the thiamin equivalents of 1 slice of whole wheat bread or other thiamin-food by determining the amount of each of the foods selected in paragraph a will furnish the same number of milligrams of thiamin as are contained in the food chosen. Display for discussion. Record data in Table 36.

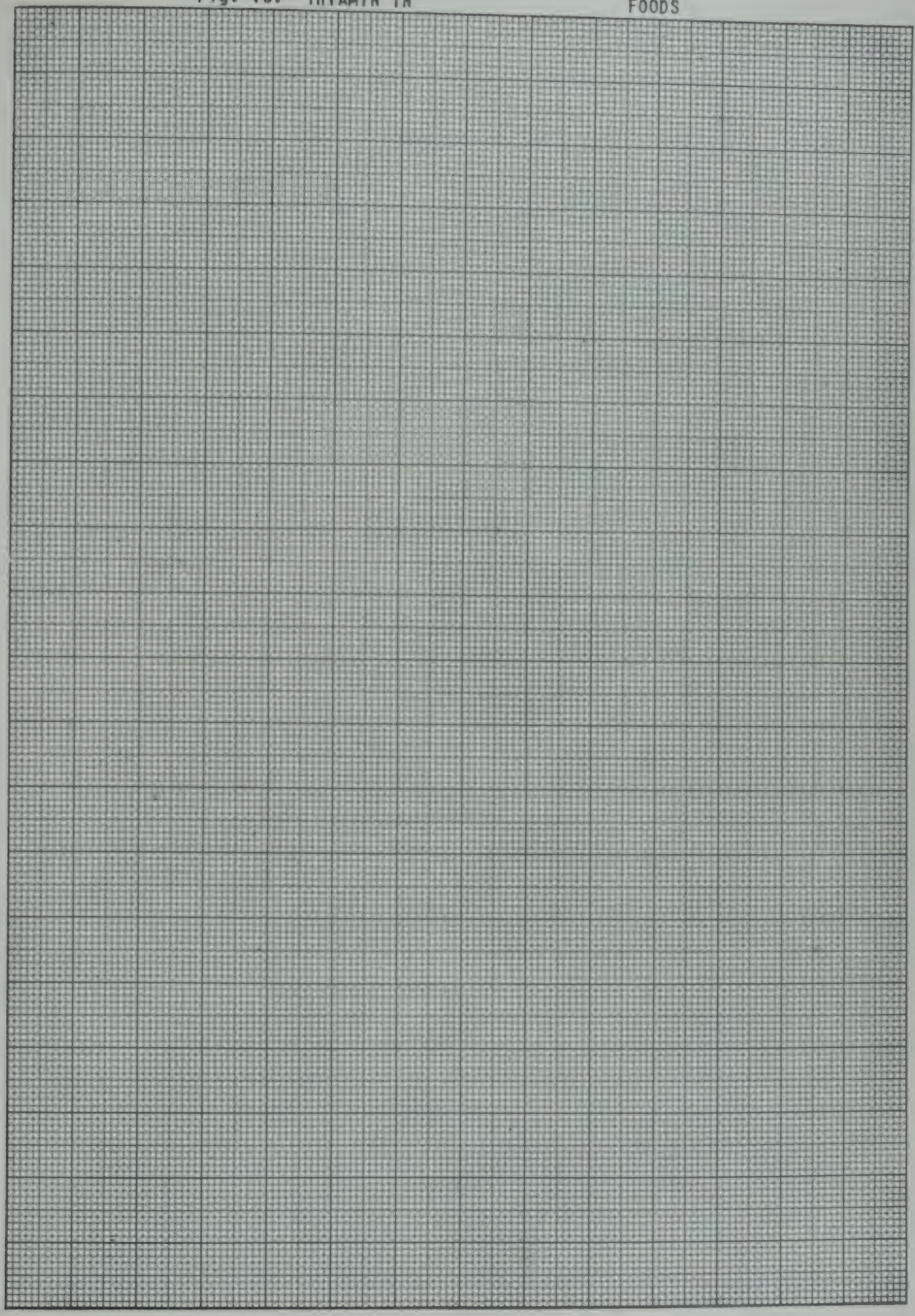
e. Show data from either a or c graphically in Fig. 10.

TABLE 36

Thiamin Equivalents of

Food	Wt.gm.	Meas.	Cost

Fig. 10. THIAMIN IN FOODS



4. Riboflavin.

TABLE 37

Food Sources of Riboflavin[1]

Type of Food	Excellent Sources	Good Sources	Fair Sources
Animal products	Cheese Eggs Heart Kidney Liver Milk, dried whole or skim condensed evaporated Muscle meat, lean	Buttermilk Milk, fresh (whole or skim) Whey	
Vegetables	Beet tops Kale Mustard greens Turnip tops	Broccoli Cabbage Carrots Cauliflower Collards Endive Lettuce, green Lima beans Peas Spinach Watercress	
Fruits		Avocados Mangoes Peaches Pears Prunes	Apples Apricots Bananas Figs, cured Grapefruit Guavas Muskmelons Oranges Papayas
Seeds	Peanuts Rice polishings Soybeans Wheat, germ portion	Dried legumes Wheat, whole grain	

[1]Bureau of Home Economics. Vitamin Content of Food. Human Nutrition. Reprint of Part 1, U. S. D. A. 1939 Yearbook, page 290. Courtesy of Bureau of Home Economics.

a. Compare foods containing riboflavin by determining the number of milligrams of riboflavin in 100-gram portions of 10-20 of the riboflavin foods listed above. Record data in Table 38 in descending order of riboflavin value.[1]

b. Determine for each of the foods chosen in paragraph a the weight, measure, and cost of the amount of each which will furnish 1/10 of the adult daily requirement for riboflavin.[2] Record data in Table 38. Display the foods for discussion.

c. Determine the weight, measure, cost, and number of milligrams of riboflavin in the average servings of each of two foods chosen in paragraph a. Record data in Table 38.

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[1]Sherman units or micrograms may be used although the method of stating riboflavin content and requirement in milligrams is preferred. 1 Sherman Unit of riboflavin = 2.5 micrograms of riboflavin or 0.0025 milligram.

[2]Requirements for riboflavin, see Table 1.

TABLE 38

Riboflavin in Foods

Food	Riboflavin mg. in 100 gm.	Furnishes 1/10 daily riboflavin requirement			Average Serving			
		Wt.gm.	Meas.	Cost	Wt.gm.	Meas.	Riboflavin mg.	Cost

d. Study the riboflavin equivalents of 2 or 4 ounces of meat or dried milk or 1 egg by determining the amount of each of the foods selected in paragraph a which will furnish the same number of milligrams of riboflavin as contained in the food chosen. Display for discussion. Record data in Table 39.

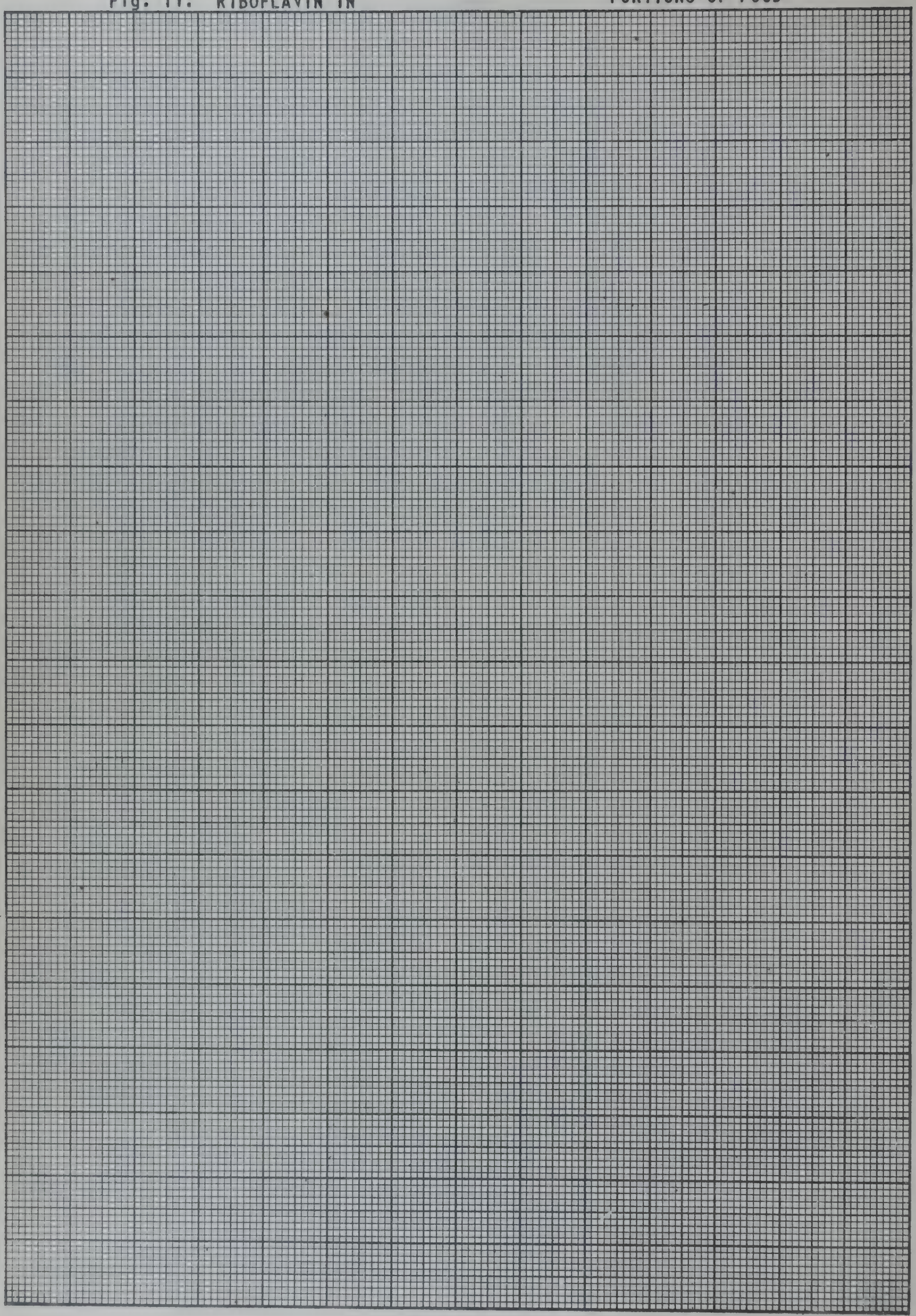
e. Show data from a or c graphically in Fig. 11.

TABLE 39

Riboflavin Equivalents of

Food	Mess.	Wt. in gm.	Cost

Fig. 11. RIBOFLAVIN IN PORTIONS OF FOOD



5. Nicotinic acid (niacin).

TABLE 40

Food Sources of Nicotinic Acid[1]

Type of Food	Good to Fair Sources	
Animal products	Chicken	Liver
	Beef, fresh corned	Milk, skim (fresh and dried)
	Buttermilk	evaporated
	Egg yolk	Pork, lean
	Haddock	Rabbit
		Salmon
Vegetables	Cabbage, green	Peas, green
	Collards	Soybeans
	Cowpeas	Spinach
	Kale	Tomato juice
	Mustard greens	Turnip greens
Seeds	Peanut meal	
	Peas, green (dried)	
	Wheat germ	

a. Compare foods containing nicotinic acid by determining the number of milligrams of nicotinic acid in 100-gram portions of 10-15 of the foods listed above. Record data in Table 41.

b. Determine for each of the foods chosen in paragraph a the weight, measure, and cost of the amount of each which will furnish 1/10 of the adult daily requirement for nicotinic acid. Record data in Table 41. Display the foods for discussion.

c. Determine the weight, measure, cost, and number of milligrams of nicotinic acid in the average servings of each of the foods named in paragraph a. Record data in Table 41.

d. Show data from a or c graphically in Fig. 12.

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[1]Bureau of Home Economics. Vitamin Content of Foods. Human Nutrition, Report of Part 1. U. S. D. A. 1939 Yearbook, page 291.

[2]Tables of Nicotinic acid value:
Journal of Nutrition: 19, 487, 489, 1940. Tables I, II. Also, 25, 275, 1943.
C. W. Weiser and S. F. Berryman. "Nicotinic Acid in Foods." Food Research: 4, 159. 1939.

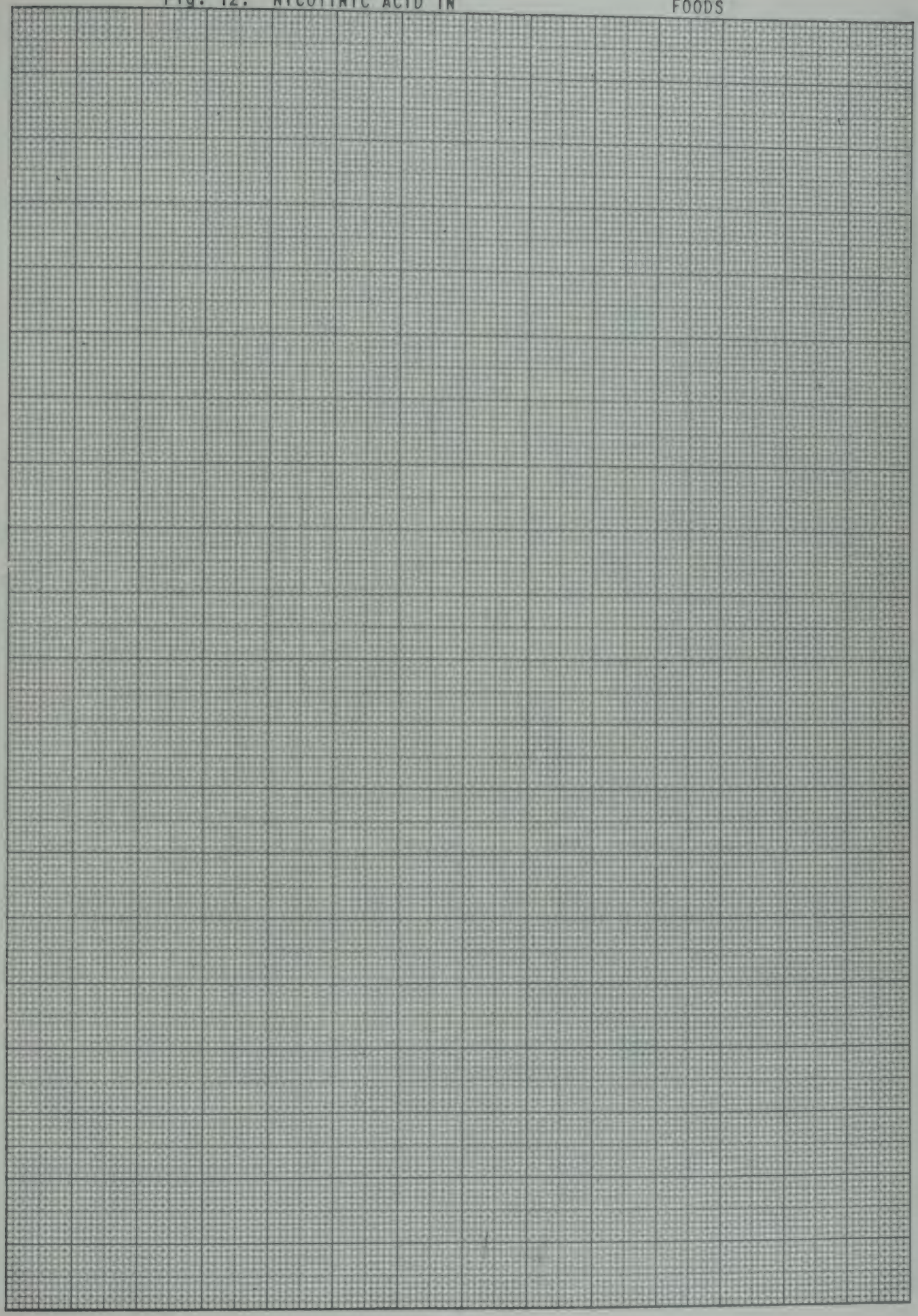
[3]Requirements for nicotinic acid, see Table 1.

TABLE 41

Nicotinic Acid in Foods

Food	Nicotinic Acid mg. in 100 gm	Furnishes 1/10 daily nicotinic acid requirement			Average serving			
		Wt. gm.	Meas.	Cost	Wt. gm.	Meas.	Vitamin C Units	Cost

Fig. 12. NICOTINIC ACID IN FOODS



6. Ascorbic acid.

TABLE 42

Food Sources of Ascorbic Acid[1]

Type of Food	Excellent Sources		Good Sources
Animal products	Brain Liver		
Vegetables	Asparagus Broccoli Brussel sprouts Cabbage Corn salad Collards Dandelion greens Kale Kohlrabi Mustard greens	Peas, green Peppers, sweet Radishes Rutabagas Spinach Tomatoes, fresh canned Turnips Turnip greens	Artichokes, globe Beans, green Cucumbers Endive Leeks Onions Parsnips Potatoes, white sweet Rhubarb
Fruits	Cantaloup Currants Gooseberries Grapefruit Guavas Lemons	Mangoes Oranges Raspberries Strawberries Tangerines	Apples Avocados Bananas Cherries Cranberries Papayas Pineapple Watermelon
Seeds	Seeds, sprouted		

a. Compare foods containing ascorbic acid by determining the number of milligrams of ascorbic acid in 100-gram portions of 10-20 of the ascorbic acid foods listed above. Record data in Table 43 in descending order of ascorbic acid value.

b. Determine for each of the foods chosen in paragraph a the weight, measure, and cost of the amount of each food which will furnish 1/10 or 1/2 of the adult daily requirement for ascorbic acid. Record data in Table 43. Display the foods for discussion.

c. Determine the weight, measure, cost, and number of milligrams of ascorbic acid in the average serving of each of the foods chosen in paragraph a. Record data in Table 43.

d. Show data from a or c graphically in Fig. 13.

e. What are the important sources of ascorbic acid in low-cost dietaries?

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[1]Bureau of Home Economics. Vitamin Content of Foods. Human Nutrition. Reprint of Part 1, U. S. D. A. 1939 Yearbook, page 289. Courtesy of Bureau of Home Economics.

[2]International Units may be used although preference is given to milligrams.

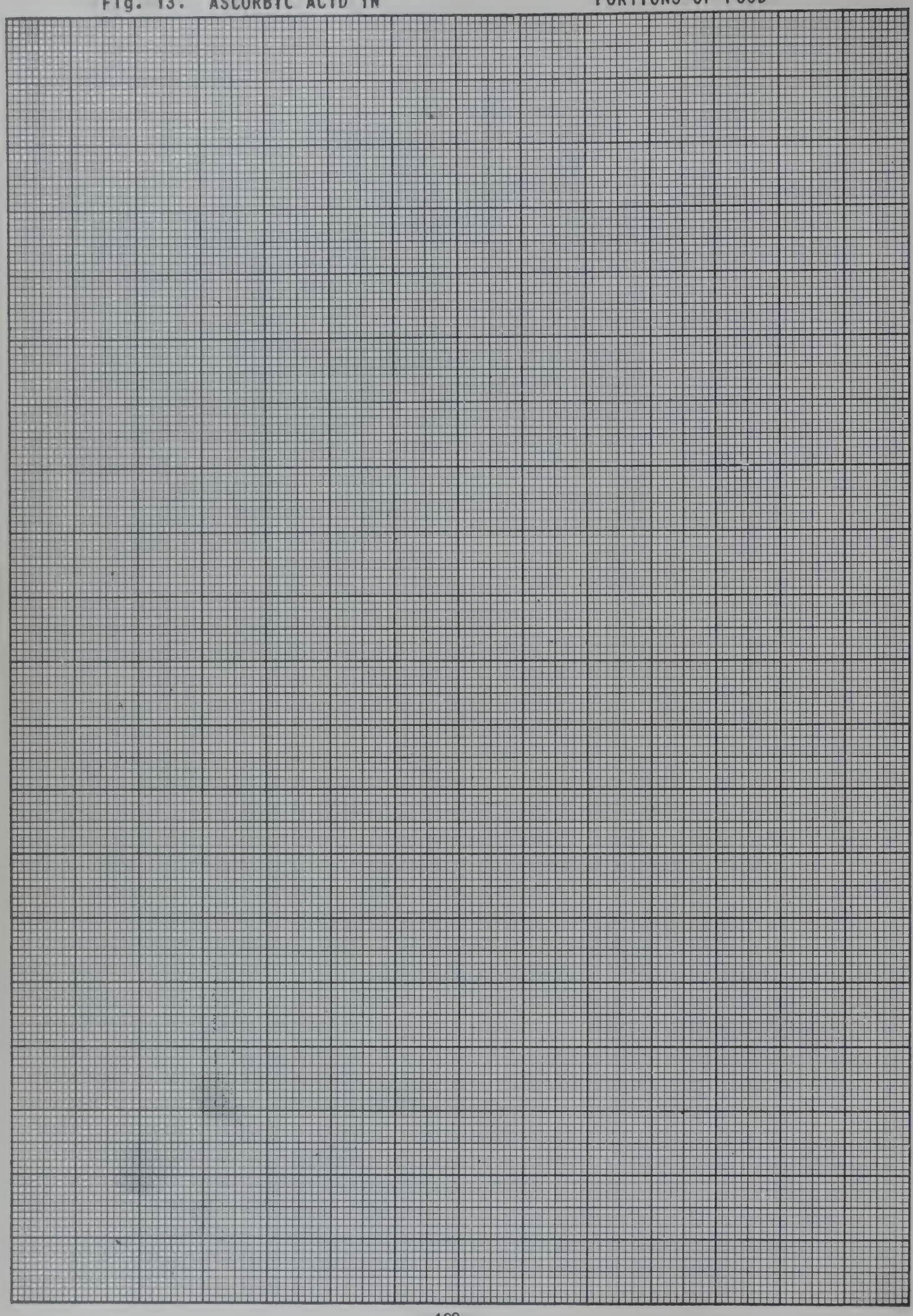
[3]Requirements for ascorbic acid, see Table 1.

TABLE 43

Ascorbic Acid in Foods

Food	Ascorbic acid mg. in 100 gm.	Furnishes daily vit. C requirement			Average Serving			
		Wt.gm.	Meas.	Cost	Wt.gm.	Meas.	Vitamin C units	Cost

Fig. 13. ASCORBIC ACID IN PORTIONS OF FOOD



f. Study the ascorbic acid equivalents of 4, 6 or 8 ounces of orange juice by determining the amount of each of the foods listed in Table 44 which will furnish the same amount of the vitamin as the orange juice. Record data in Table 44. Weigh, measure, and display these foods for discussion.

g. Compare the ascorbic acid content of various fruit and vegetable juices by determining the milligrams in 4, 6 or 8 ounce portions. Record data in Table 44.

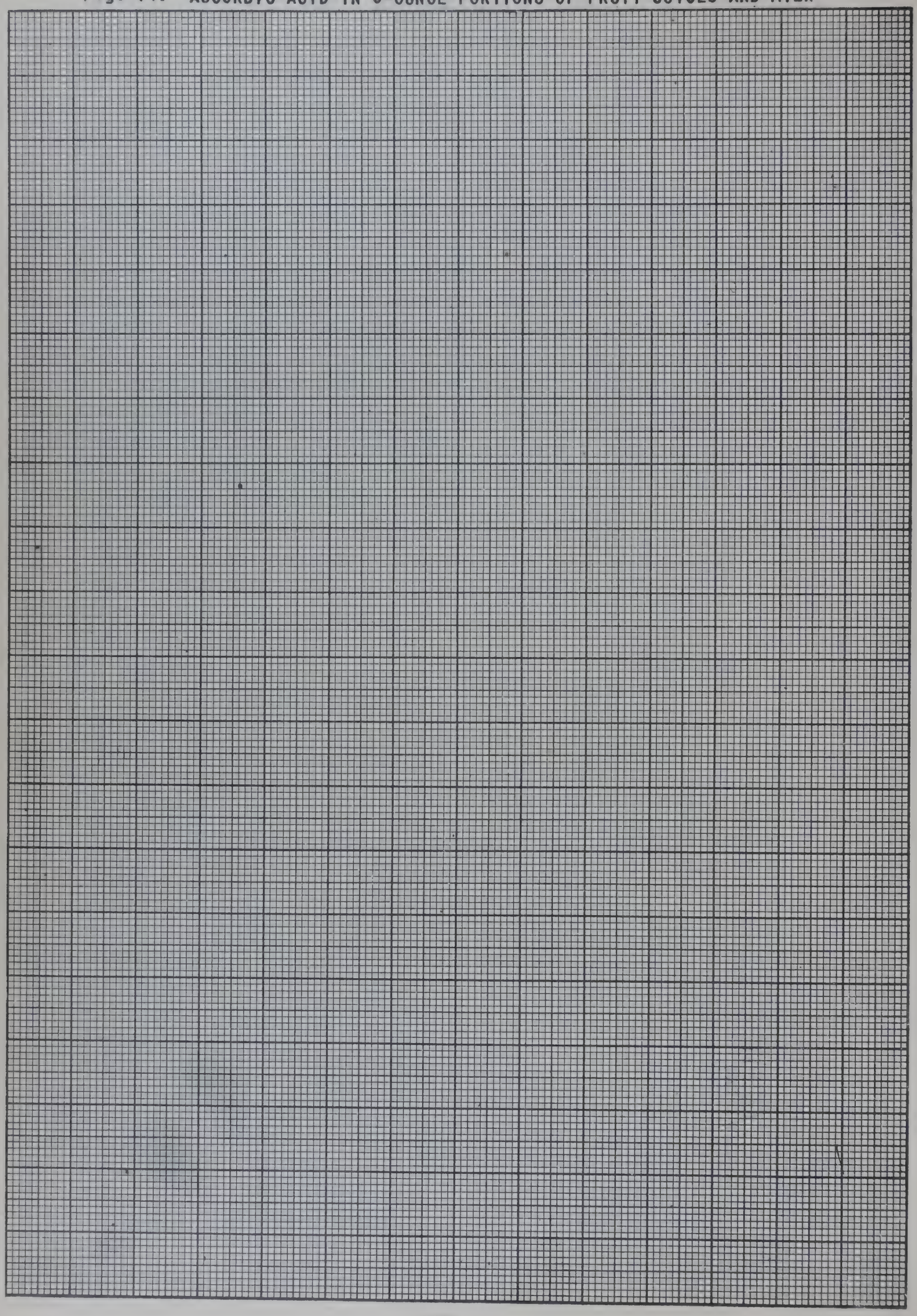
h. Show the data from paragraph f graphically on Fig. 14.

TABLE 44

Ascorbic Acid Equivalents

Food	Furnishes the same number of milligrams of ascorbic acid as 6 oz. orange juice			Ascorbic acid content of 6-oz. portions		
	Wt. gm.	Meas.	Cost	Meas.	Ascorbic acid mg.	Cost
Orange juice						
Lemon juice						
Grapefruit juice						
Tomato juice						
Pineapple juice						
Cranberry juice						
Grape juice						
Sauerkraut juice						
Whole milk						
Cabbage						
Green pepper						
Spinach						
Strawberries						

Fig. 14. ASCORBIC ACID IN 6-OUNCE PORTIONS OF FRUIT JUICES AND MILK



7. Vitamin requirements. What are your daily requirements for vitamin A, thiamin, ascorbic acid, riboflavin, and nicotinic acid?	Daily requirement of: Vitamin A Thiamin Ascorbic acid Ribovlavin Nicotinic acid
8. Vitamin intake. Calculate the vitamin A, thiamin, ascorbic acid, riboflavin, and nicotinic acid content of each of the first three days of your dietary record. What is your average intake for each of the vitamins?	Average intake of: Vitamin A Thiamin Ascorbic acid Riboflavin Nicotinic acid
If your intake of vitamins was inadequate for your requirements, what suggestions can you make for improving the vitamin content of your diet?	
Formulate some general rules to follow in the selection, the preparation for cooking, and the serving of foods which will insure an adequate amount of the vitamins in the daily diet. Star those rules which apply also to minerals.	Selection Preparation Cooking

9. Using average servings of foods and keeping in mind the foods suggested by "The Basic Seven," pages 9 and 10, list in Table 43 the foods to include in your daily diet to insure a sufficient amount of all the vitamins.

TABLE 45

Foods for Adequate Vitamins

Food	Wt. gm.	Meas.	Vit. A I.U.	Thiamin mg.	Riboflavin mg.	Ascorbic acid mg.	Nicotinic acid mg.
Totals							
Standards							

10. Comparative cost of vitamins in different forms (foods and concentrates).

Compare the cost of 1/2 of the adult daily requirement of vitamin A, thiamin, riboflavin, ascorbic acid, and vitamin D, when secured from one or several good food sources and from one or several widely advertised and sold drugstore concentrates. Record data in Table 46.

TABLE 46

Cost of Vitamins in Foods and Concentrates

Vitamin	Name and Cost of Food Source				Name and Cost of Concentrate[1]			
	1st Food	2nd Food	3rd Food	4th Food	1st Concentrate	2nd Concentrate	3rd Concentrate	4th Concentrate

What conclusions can be drawn from the above study?

---

[1]Ask local druggists for the names of the vitamin A, thiamin, riboflavin, ascorbic acid, and vitamin D concentrates most frequently asked for, and secure information about vitamin values from the labels.

11. Summarize, in Table 47, information about each of the vitamins.

TABLE 47

Vitamin Summary

Name or Names of vitamin	Chemical tests	Clinical tests	Functions in nutrition	Requirement

Body Regulators

Certain regulatory substances are required both for good digestion and intestinal hygiene as well as for optimum conditions within the body cells and tissues. Fiber, referred to as roughage, cellulose, or bulk[1] is essential for proper functioning of the digestive tract. Although water exerts its most important regulating functions in the tissues, it also is necessary for normal activity of the alimentary tract. Certain mineral elements held in solution in body fluids also perform regulatory functions, among which is the maintenance of body fluids in a neutral state.

Fiber or cellulose is not considered a food material. It is of no use to the body as a whole since the human digestive tract is furnished with no enzymes to digest it. It has an important function in the digestive tract, however, in giving a certain amount of residue or indigestible substances to the food, acting as a stimulant to the peristaltic action. It, therefore, favors intestinal hygiene and helps to prevent constipation.

Foods containing considerable amounts of cellulose or residue are fruits and vegetables with skins and seeds and whole cereals with their outer layers of bran. Milk, refined cereals and their products, meats, fats, potatoes, and sugar have a very low roughage value.

Water is a foodstuff, the simplest one, since it is made up of but two elements, hydrogen and oxygen. Though it is not capable of yielding energy because it contains no unoxidized hydrogen, yet its functions in the body are so vital that it must be considered a very important foodstuff. Two-thirds of the body weight is made up of water, water being a fundamental part of every cell. Active tissues contain more water than others. A larger percentage is present in the body during the growing period.

Water is continually being lost in the form of urine from the kidneys, in moisture in the air from the lungs, and in the perspiration from the skin, about 2 quarts being so lost daily. This loss is made good by the fluids in the diet, the moisture in the foods eaten, and the water formed in the body by the combustion of foodstuffs. All foods, no matter how dry they appear to be, contain some water; certain vegetables have as much as 94 per cent. The equivalent of six to eight glasses of water needs to be taken daily.

Mineral elements which are left in the tissues after foods are digested, absorbed, and burned may possess either acid- or base-forming properties. If the foods eaten contained an excess of calcium, sodium, magnesium, and iron, they are said to be base-forming and they show basic properties in their residue. To the presence in other foods of a predominating amount of chlorine, sulfur, and phosphorus is due their acid-forming property, and the residue has an acid reaction.

Base-forming foods include milk, vegetables, nuts, and all fruits except prunes, plums, and cranberries. Most fruits, even though acid to taste, leave a basic residue in the blood and tissues after their digestion and absorption. The acid is organic in nature and can be oxidized in the same manner as carbohydrates and fats. Prunes, plums, and cranberries are acid-forming because they contain an acid (benzoic) which the body cannot utilize as it does other fruit acids.

The acid-forming foods are meat, fish, eggs, cereals and breadstuffs, and prunes, plums, and cranberries. In the ordinary diet, if well selected, the base-forming elements probably predominate, although the evidence is not complete that this is a necessity.

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[1] "Indigestible carbohydrate" is now used in place of "bulk."

Outline of Unit

A. Regulatory action of food in the digestive tract.

1. Meaning of "digestibility" of food.
2. Factors affecting digestibility.
3. Relation of food to good intestinal hygiene.
4. Requirements for cellulose and fiber.
5. Factors in the prevention and cure of constipation.
6. Fads and fallacies regarding the "roughage" and "bran" question.

B. Water as a regulating foodstuff.

1. Functions of water in the digestive tract; in the cells.
2. Daily requirements for water.
3. Sources of water in the diet.

C. Acid-base equilibrium in the body.

1. Sources of acid production in the body.
2. Mechanisms by which the body maintains a constant pH.
3. Acid- and base-forming foods.
4. Fads and fallacies regarding "acidosis."

D. References.

Residue

Chaney, M. S., and M. Ahlborn. Nutrition. Chapter XII.

Bogert, L. J. Nutrition and Physical Fitness. Chapters XV, XXVI; pages 214-215.

Water

Chaney, M. S., and M. Ahlborn. Nutrition. Pages 248-253.

Rose M. S. Foundations of Nutrition. Chapter VII.

Bogert, L. J. Nutrition and Physical Fitness. Pages 212-213.

Talbot, J. H. "Handbook of Nutrition. V. Water and Salt Requirements in Health and Disease." Jour. Am. Med. Assoc.: 119, 1418, 1942.

Acid-base equilibrium

Chaney, M. S., and M. Ahlborn. Nutrition. Pages 253-258.

Bogert, L. J. Nutrition and Physical Fitness. Pages 108-110.

Sherman, H. C. Chemistry of Food and Nutrition. Chapter XIII.

Rose, M. S. A Laboratory Handbook for Dietetics. Pages 55-56; 295-297.

E. Supplementary questions for study and discussion.

1. How is the coefficient of digestibility explained? Which give the greater percentage of digestibility, foods from animal sources or those from vegetable sources? How is this difference explained?
2. In which ways is the meaning of the term digestibility interpreted? Which is the more usual?
3. Upon which factors does efficient gastric digestion depend?
4. Describe the conditions which determine the speed with which food passes through the intestinal tract.
5. What undesirable results occur when waste material is retained unduly in the intestinal tract?

6. What four characteristics of food aid in the elimination of waste from the intestinal tract? What is the specific effect of each?
7. What is the adult daily requirement for food fiber?
8. What is meant by changing the intestinal flora? How may this be accomplished?
9. What conditions other than the kinds of foods are important in good intestinal hygiene?
10. Discuss the pros and cons of the question of additional "roughage" or bran in the intestinal tract.
11. How does water function in nutrition as a foodstuff? Why is it said to have both a building and a regulating function?
12. In what forms does the body secure its daily liquid requirement? Through what channels is it eliminated?
13. What is the relation of water intake and body fluids to weight?
14. What factors effect the amount of water needed by an individual? What is the effect of each?
15. How can one be assured of the correct amount of fluid in the diet?
16. Describe the various sources of acid substances in metabolism; of basic substances?
17. Which foods leave an acid reaction in the body? why? a basic reaction? Why? Can a food which is acid in reaction ever be base-forming in the body? Explain.
18. What organic acids are present in foods? What is known concerning the ability of the body to metabolize each?
19. What is meant by the pH of the blood? What means does the body possess to help it in maintaining a constant pH of the blood? Explain.
20. What is true acidosis? Under what conditions only may it occur?
21. What foods are ketogenic? antiketogenic?

7. Vocabulary of terms to be understood:

acid ash residue
acid-base balance
acidosis
acid-forming
alkaline ash residue
alkalosis
antiketogenic
Bacillus acidophilus
Bacillus lactic acid
base-forming
bicarbonate-carbonic acid system
bland diet
buffer
bulk
carbon dioxide combining power
cellulose
chloride shift
coefficient of digestibility
constipation
digestibility
fiber
food ash
high residue
indigestible carbohydrate
inorganic acid
ketosis
low residue
organic acid
permeability
pH
regulator
residue
rough bulk
soft bulk
water balance

G. Problems.

1. Calculate the fiber content on each of the first three days of your dietary record. Record data in proper columns in Table 3.

What is your daily requirement for fiber?	Daily requirement for fiber equals
What is the average figure for your fiber intake?	Average fiber intake equals
If your average daily intake of fiber is not sufficient for your needs, what changes can you suggest in your choice of foods?	
What general statement can be made regarding foods high in fiber? low in fiber?	

2. Adapt the following menu for the person who needs a diet high in roughage and also for the person who needs a diet low in roughage. Make necessary changes in the form of the foods in either case.

TABLE 48
High- and Low-Roughage Menus

Menu	High-roughage	Low-roughage
Breakfast		
Stewed prunes		
Pettijohns with top milk and cream		
Scrambled eggs		
Buttered whole-wheat toast		
Coffee or cocoa		
Luncheon		
Cream of tomato soup		
Waldorf salad		
Raisin graham muffins		
Caramel nut pudding		
Oatmeal cookies		
Milk		
Dinner		
Fruit cup		
Roast beef, mushroom gravy		
Baked potatoes		
Buttered peas		
Creamed onions		
Tomato jelly salad		
Bread and butter		
Pineapple ice cream		
Coffee		

3. When is it desirable to have a diet high in roughage value?	
When is it desirable to have a diet low in roughage value?	

4. Calculate the water content on each of the first three days of your dietary record. Record data in the proper columns of Table 4.

What is your daily requirement for water?	Water requirements equals	
What is the average figure for your intake of water from the foods in your diet? as a liquid?	Average daily water intake in food equals as a liquid equals	
If your average daily intake of water is not sufficient for your needs, how will you remedy this?		
Which of the foods in your diet rank high in water content? low in water content?	Foods high in water	Foods low in water

5. Calculate the acid and base values on each of the first three days of your dietary record. Record data in the proper columns of Table 3.

What is the average acid figure? the average base figure?	Average acid value Average base value
If acid predominates over base, what changes can you suggest in the choice of foods on your diet?	

6. You have now completed the study of your requirements for all of the nutritional essentials as well as your average intake of these essentials as determined by your dietary record for one week. What specific suggestions can you make in regard to your choice of foods for the future?

Unit Four

NUTRITIONAL CONTRIBUTIONS OF THE VARIOUS FOOD GROUPS

Single foods vary in the proportions of each of the foodstuffs present. The nutritive characteristics of foods, therefore, vary as well. However, many single foods having a similar composition and nutritional value may be grouped together according to their most significant nutritional characteristics. The usual grouping includes milk and milk products; breadstuffs and other grain products; furits and vegetables; meats, including fish and poultry; eggs; fats; and sugars. Such a grouping of foods into larger classes makes for convenience in studying nutritive values and aids in the substitution of one food for another within a food group.

Twelve food groups suggested by workers in the Bureau of Home Economics are: (1) milk; (2) potatoes and sweetpotatoes; (3) dry mature beans, peas, and nuts; (4) tomatoes and citrus fruits; (5) leafy green and yellow vegetables; (6) other vegetables and fruits; (7) eggs; (8) lean meat, poultry, and fish; (9) flours and cereals; (10) butter; (11) other fats; (12) sugars.

Outline of Unit

I. Dietary properties of the various food groups.

   1. Nutritional contributions in calories, protein, minerals, and vitamins of:
      a. Milk.
      b. Grains and grain products.
      c. Fruits and vegetables.
      d. Protein foods.
      e. Fats; sugars and other sweets.

II. Comparison of the nutritional contributions of specific foods within each of the food groups.

   1. Relative nutritional value of various forms of milk and cheese.
   2. Comparison of various fruits and vegetables.
   3. Comparison of refined, unrefined, and enriched cereals and cereal products.
   4. Relative nutritional values of various forms of protein foods.
   5. Nutritive values of various forms of fats and sugars.

III. Textbook references.

Rose, M.S. Foundations of Nutrition. Chapters XIX - XXIV.
Bogert, L.J. Nutrition and Physical Fitness. Chapters I, II, III, IV, V, VI.
Sherman, H.C. Chemistry of Food and Nutrition. Chapter XXVIII; pp. 526-528.
McCollum, E.V., E. Orent-Keiles, and H.G. Day. Newer Knowledge of Nutrition. Chapter XXIV.
Sherman, H.C. and C.S. Lanford. Essentials of Nutrition. Chapter XIX.

IV. General references.

American Medical Association. Food Charts: Sources of Dietary Essentials.
Maynard, L.A. "Handbook of Nutrition. XII. Foods of Plant Origin." Jour. Am. Med. Assoc.: 120, 692, 1942.

Nutrition Chart Company, Minneapolis. Food Color Charts.
Philadelphia Child Health Society. Vegetables for Victory Charts. Mineral and Vitamin Charts.
Sherman, H.C. Food Products. Chapters III, IX, V, VI, VII, VIII, X, XI, XX, XIII.
Sherman, H.C., and C.S. Pearson. Modern Bread from the Standpoint of Nutrition.
70 Questions on Enriched Flour and Bread, Revised 1942.
Wilder, R.M., and T.E. Keys. "Handbook of Nutrition. XIV. Unusual Foods of High Nutritive Value." Jour. Am. Med. Assoc.: 120, 529, 1942.

V. Problems.

1. Summarize briefly in Table 49 the nutritional contributions made to the diet in respect to calories, protein, minerals, and vitamins by each of the food groups.

TABLE 49

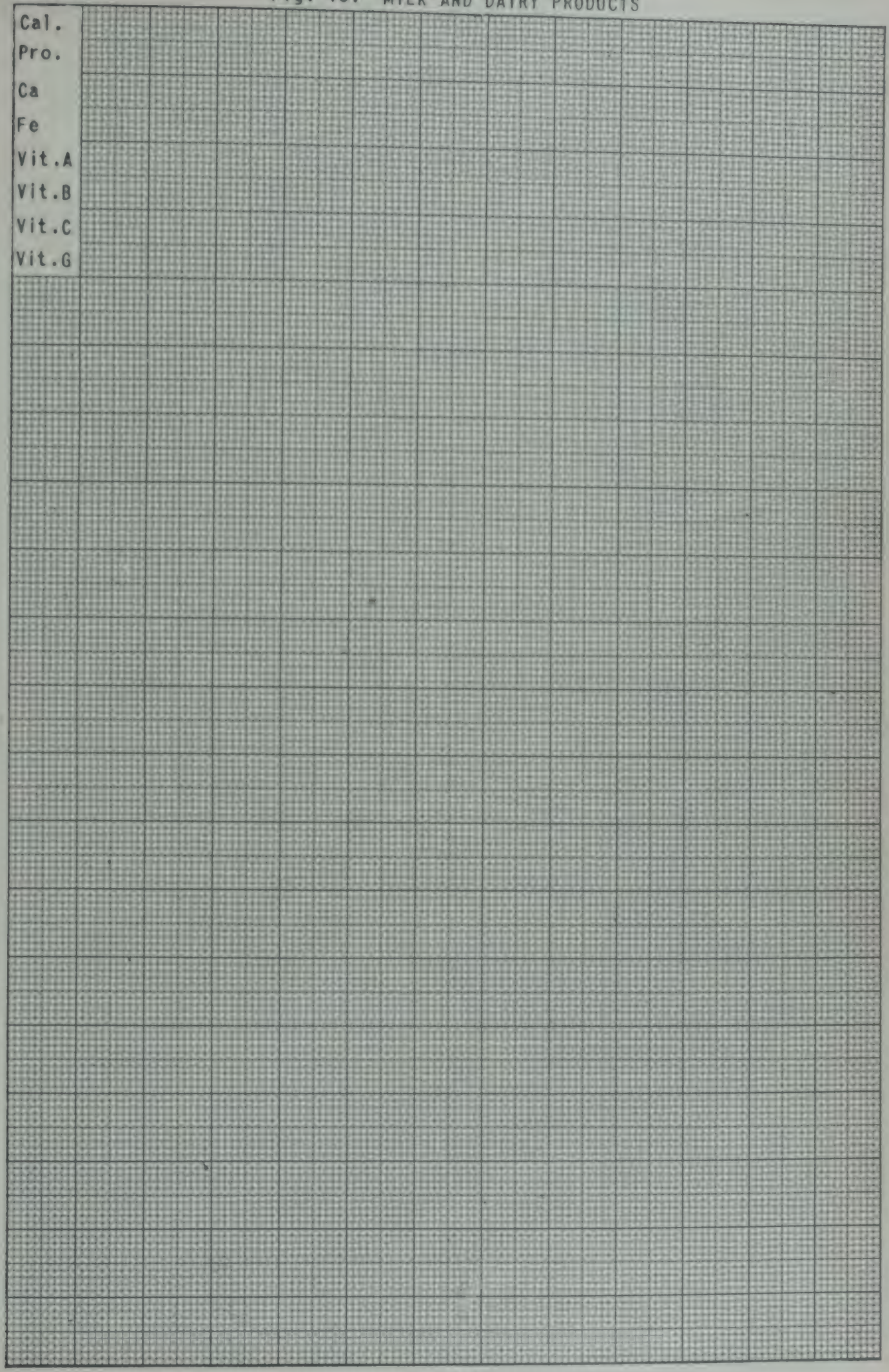
Nutritional Contributions of the Food Groups

Food group	Calories	Protein	Minerals	Vitamins
Milk and milk products				
Vegetables				
Fruits				
Protein foods (eggs, cheese, meat, fish, nuts)				
Fats				
Sugars				

2. Use Figs. 15-21, inclusive, to compare the nutritional contributions made by the average servings of several specific foods within each of the food groups by showing graphically the calorie, protein, mineral, and vitamin values of each of the foods indicated. This graphic representation may be made on the basis of the share method, showing the shares of each of the nutrients in each food; or of the percentage method, by showing what percentage of the daily requirement for each of the nutrients is contributed by each of the foods. Instead of using average servings of foods for the basis of comparison, the contributions made by 1, 5 or 10 cents' worth of the foods may be graphed. For effectiveness a different color may be used for each of the nutrients.

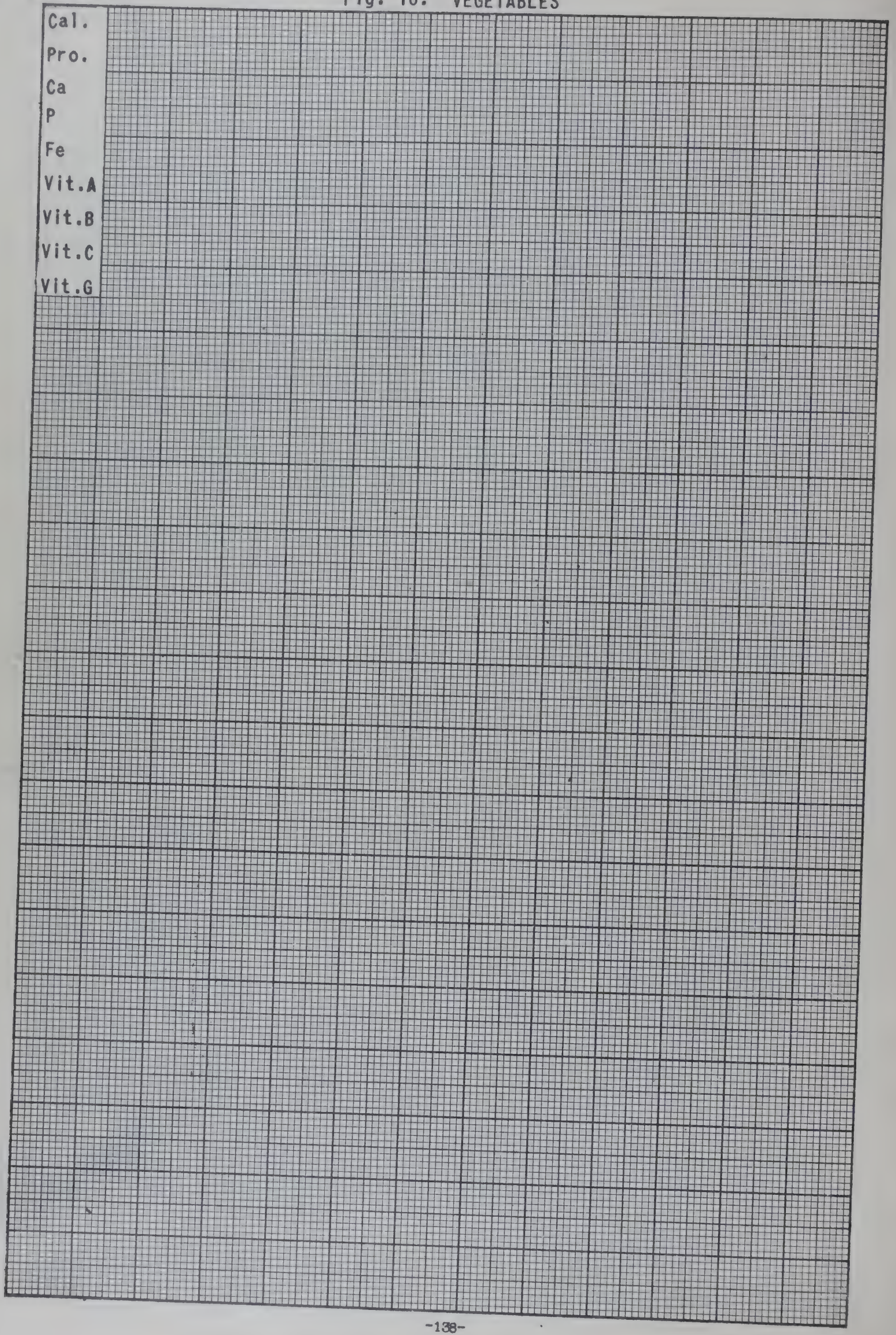
Food Nutrient

Fig. 15. MILK AND DAIRY PRODUCTS



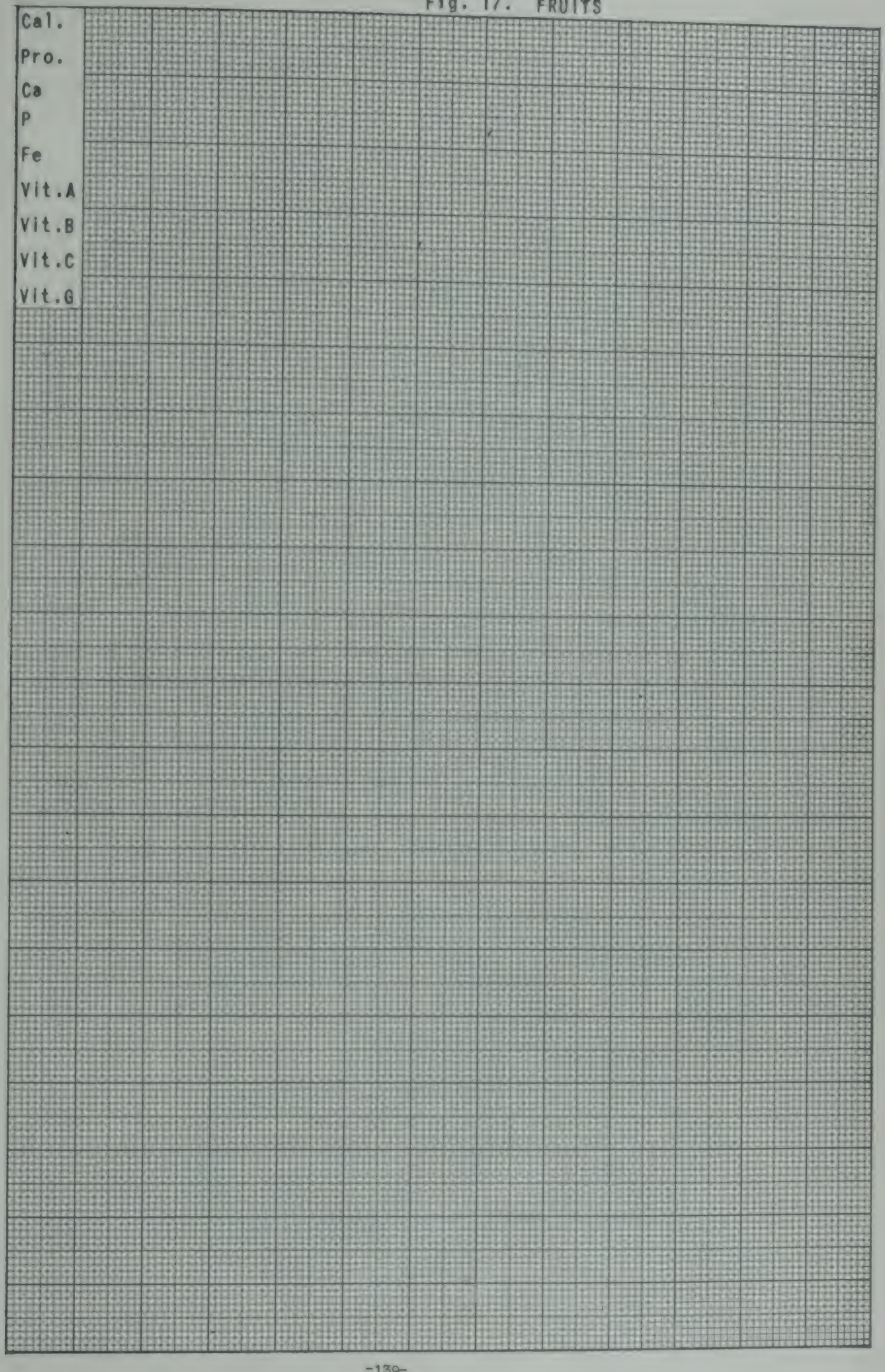
Food Nutrient

Fig. 16. VEGETABLES



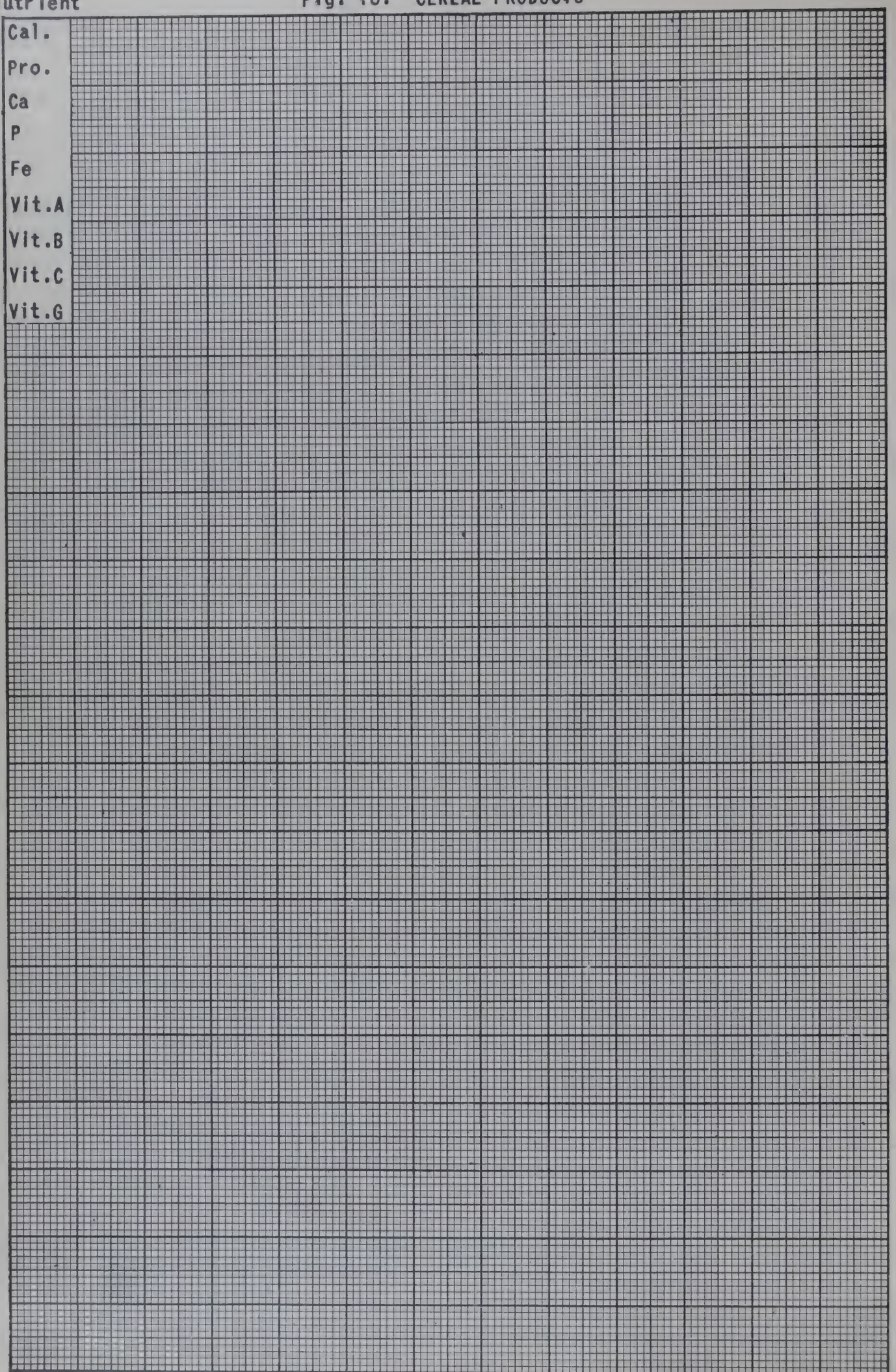
Food Nutrient

Fig. 17. FRUITS



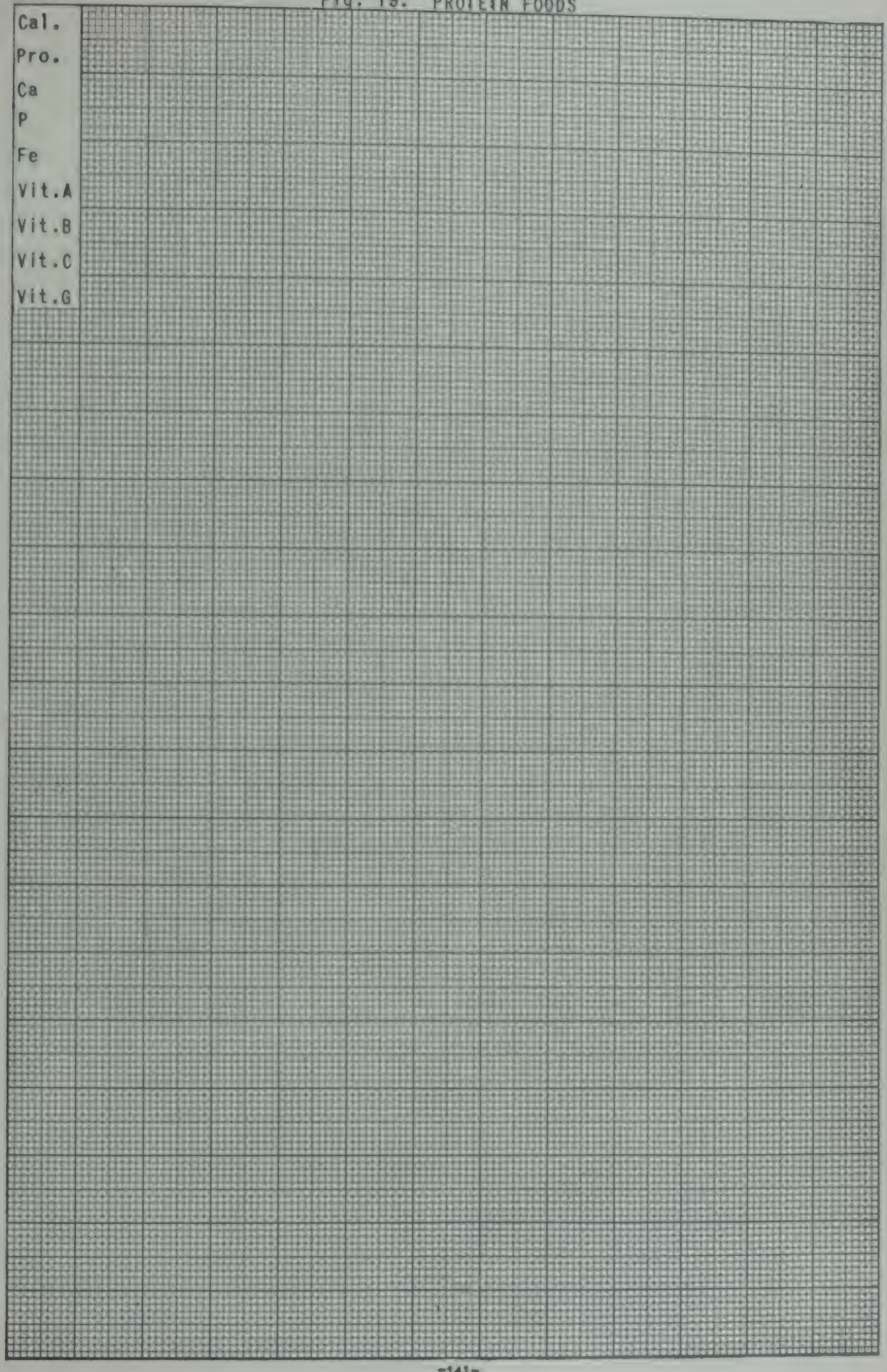
od Nutrient

Fig. 18. CEREAL PRODUCTS



Food Nutrient

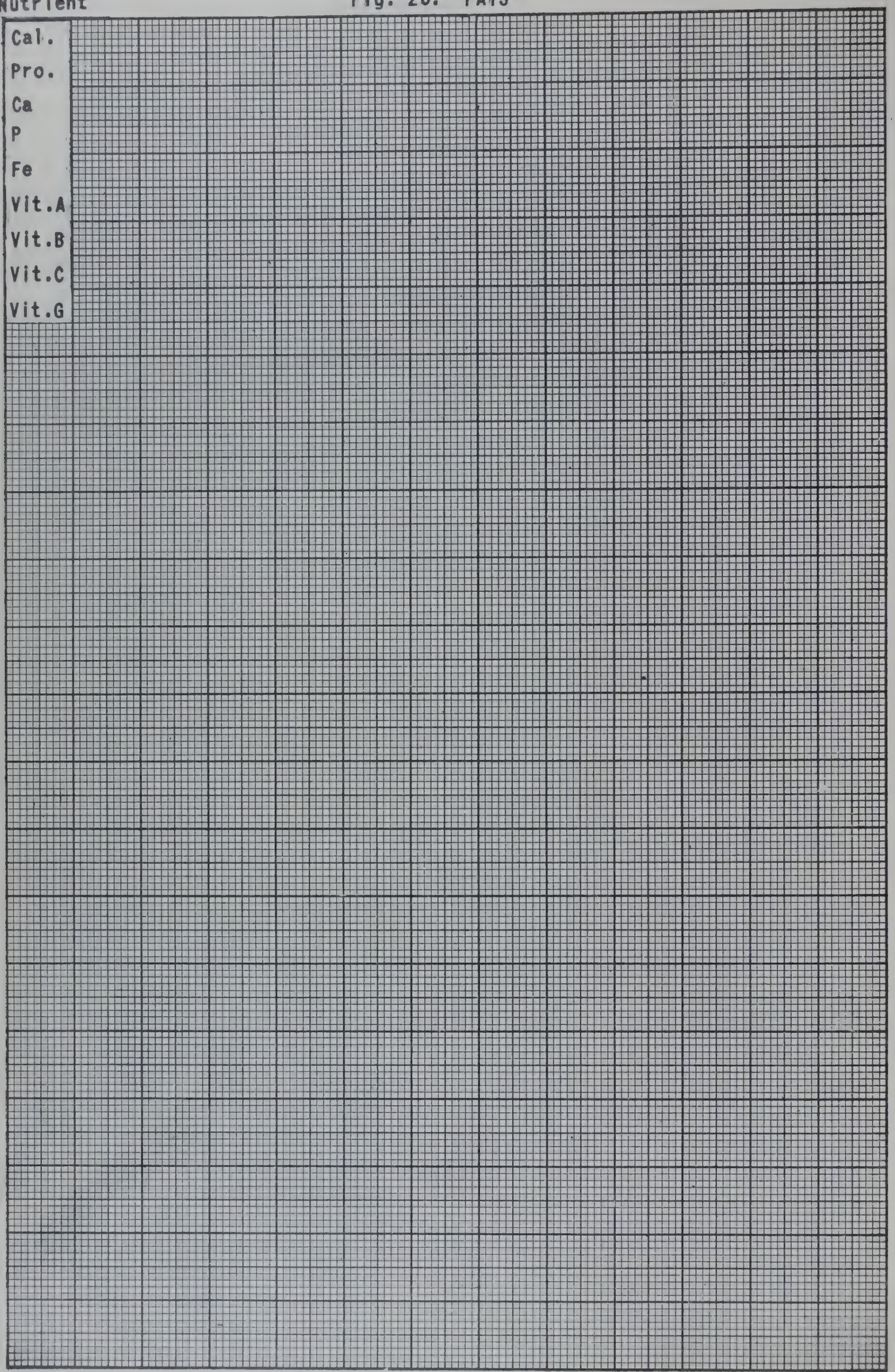
Fig. 19. PROTEIN FOODS



ood

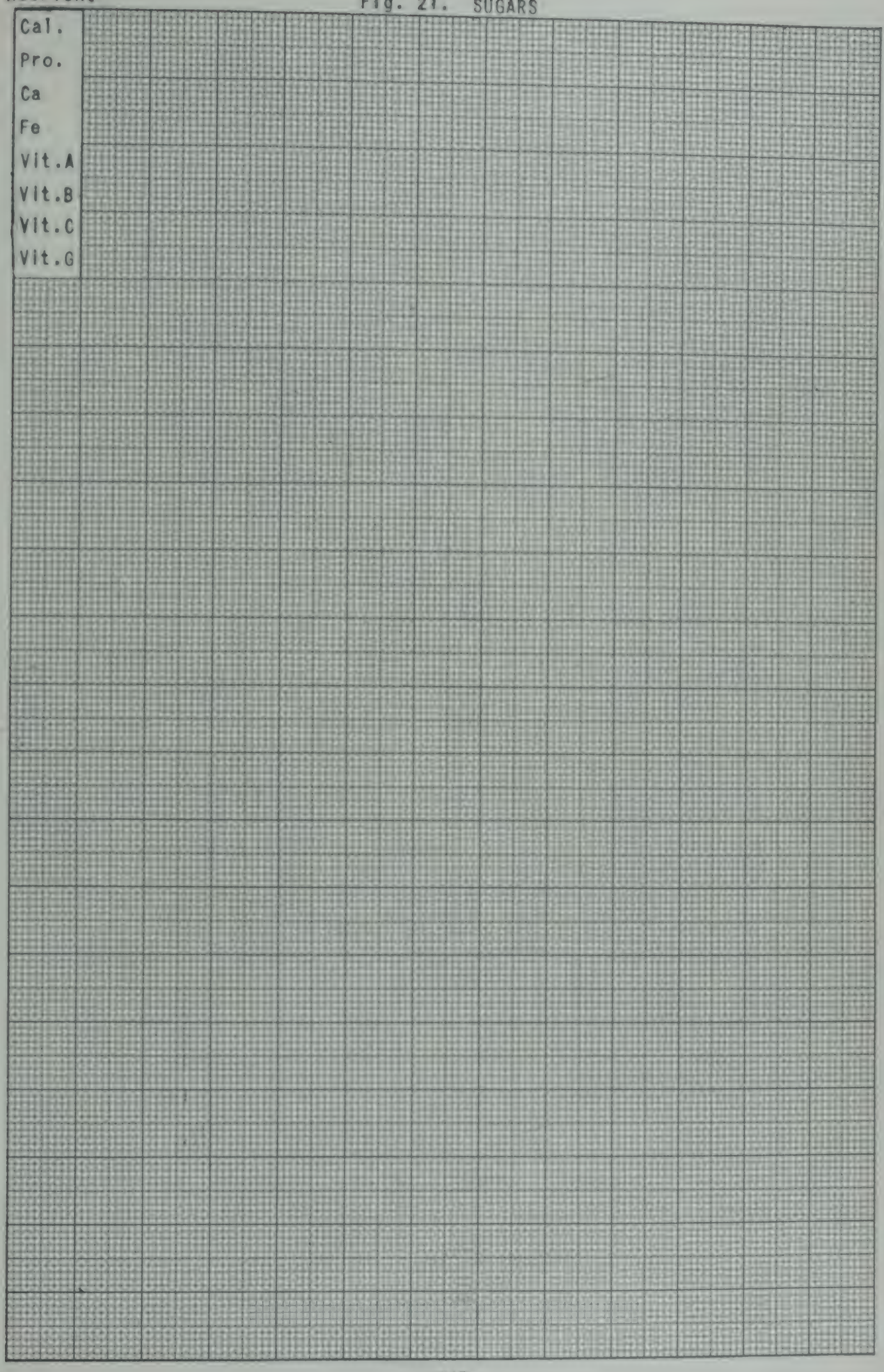
Nutrient

Fig. 20. FATS



Food Nutrient

Fig. 21. SUGARS



Unit Five

CONSTRUCTION OF ADEQUATE DIETARIES FOR OPTIMUM NUTRITION

It is generally agreed that the achievements which have been made in nutritional science during its relatively short period of existence are among the most outstanding in modern medical science. The particular significance of the "achievements dealing with the so-called newer knowledge of nutrition" to the future well-being and accomplishments is equally well recognized.

Achievements in nutritional science have necessitated many changes in emphasis. The early negative concept of health as "freedom from disease" has had to be replaced by an appreciation of the fact that there are varying degrees of health, each one dependent on the extent to which certain food requirements are recognized and met. Standards set early in nutrition study for growth and development in children are now thought to be too low since the fact that "good" nutrition can be improved with certain additions to the diet has been demonstrated repeatedly. No longer is it possible to interpret food requirements of individuals in terms of calories or energy alone; calories must be properly balanced by the right kind and amount of protein as well as by minerals and vitamins (the little things in nutrition) if food is to fulfill the functions for which it is intended.

The study of nutrition has made us aware of the fact that certain food elements are causative factors in deficiency diseases. More recently it has taught us that these same elements have equally important and more far-reaching significance in normal nutrition. Attention was formerly paid to the amounts of nutritional essentials which would prevent deficiency diseases (minimum nutrition); it is now focused on the amounts which will not only prevent disease but will promote a higher level of health as well (adequate nutrition), in short, how much will give the best results.

Today, it is realized that there is a difference between merely adequate and optimal nutrition so that "adequate nutrition" can no longer be considered synonymous with "optimal nutrition" in the case of all the nutrients. Repeated observations prove that, when liberal increases are made over the level already adequate for some of the nutrients for normal health and development, further nutritional well-being can be effected. The optimal diet was formerly thought to be the one which furnished the greatest number of calories. More recently Dr. McLester[1] defined it as that "diet which both in sickness and health will meet but not exceed a person's caloric needs and which is designed to provide as far as possible in liberal excess of today's calculated requirements, all nutritive essentials, notably protein and vitamins."

The principles of nutrition demand that the body shall have optimal amounts of energy, protein, minerals, vitamins, water, and residue; enough food, and enough of the right kinds of foods. Recommended allowances for the specific nutrients, referred to as a Yardstick for Good Nutrition, are to be found in Table 1. These allowances stated in terms of foods are met by the inclusion in the daily diet of milk, at least 1 pint for each adult and 1 quart for each child; at least two servings of fruit; at least two servings of vegetables besides potatoes; cereals and breadstuffs, about one-half or more in the form of whole grains or enriched products; one or more servings of meat, fish, poultry, or other protein food; 1 egg, sufficient butter and other fats;

[1] J.S. McLester. "The More Abundant Diet." Jour. Am. Med. Assoc.: 14, 1, 1938.

sweets to make the diet palatable and meet the calorie requirement; and plenty of water.[1] Of these, the protective[2] foods, milk and milk products, fruits, vegetables, whole-grain products, and eggs, are of especial importance. Nutrition authorities tell us that with at least one-half of the total calorie need supplied by protective foods, one-half of all cereal products in unrefined or enriched form, and one-half of all protein foods from animal sources, the nutritionally essential factors are certain to be provided in the dietary.

The selection of the daily foods on the basis of their nutritional contributions is an important consideration for every individual. In general, American dietary habits need to be greatly improved before the goal of optimal nutrition can be completely realized. The consumption of protective foods particularly needs to be increased. Recent dietary studies show the need for at least 10-50 per cent more milk, 10-25 per cent more butter, 25-70 per cent more tomatoes and citrus fruits, and about twice as much leafy, green, or yellow vegetables. Sample diet plans that meet the dietary allowance are given on page 8.

Outline of Unit

A. Optimal nutrition for the adult.

1. Specific nutrients required daily; yardstick for good nutrition.
2. Daily food needs of the adult.
3. Adequate dietaries for the college student.
4. Adequate reducing diets.
5. Evaluation of popular reducing diets.

B. Nutrition during the reproductive period.

1. Nutrients of special importance during pregnancy and lactation.
2. Qualitative and quantitative needs during pregnancy.
3. Dietaries for pregnancy and lactation: the "minimum protective" diet.

C. Optimal nutrition during the period of infancy.

1. Nutritional requirements of the infant and young child.
2. Importance of breast feeding for the infant.
3. Substitutes available for human milk.
4. Modification of cow's milk for infant feeding.
5. Proprietary foods for infant feeding: advantages and disadvantages.
6. Additions to the infant's diet during the first year.

D. Optimal nutrition during the preschool and kindergarten period.

1. Qualitative and quantitative nutritional needs of the preschool child.
2. Adequate dietaries for the preschool child.
3. Behavior problems associated with the feeding of the preschool child.

E. Optimal nutrition during the school period.

1. Nutritional essentials during the school period.
2. Adequate dietaries for different ages of the school period.

[1] See "Eat Nutritional Food," page 9, for foods on the yardstick for good nutrition.

[2] Protective foods - foods which supplement the diet in good-quality protein and the minerals and vitamins most likely to be low or lacking.

3. Effects of enriching diets already considered adequate.
4. Importance of the school lunch in the health of the school child.
5. Nutrition and the teeth.

F. Optimal nutrition for family groups.

1. Nutritional and economic considerations in feeding family groups at different income levels.
2. Adequate dietaries for various-sized family groups at different income levels.
3. Bureau of Home Economics Market lists for low-cost, moderate-cost, and liberal-cost levels.

G. American dietary habits.

1. Changes in food consumption in the past 25 years: good and poor features.
2. Dietary studies in the United States and their interpretation.

H. Racial diets and their relation to racial health.

I. Environmental factors and their relation to optimal health and nutrition.

J. Textbook references.

Adult

Chaney, M. S., and M. Ahlborn. Nutrition. Chapter XVI.
Rose, M. S. Foundations of Nutrition. Chapter XXV.
Rose, M. S. Feeding the Family. Chapters V, VI.
Bogert, L. J. Nutrition and Physical Fitness. Chapters XXI, XXIV.
Sherman, H. C. Chemistry of Food and Nutrition. Chapters XXIV, XXV.
Sherman, H. C., and C. S. Lanford. Essentials of Nutrition. Chapter XX.
McCollum, E. V., E. Orent-Keiles, and H. G. Day. Newer Knowledge of Nutrition. Chapter XXVIII.

Pregnancy and lactation

Chaney, M. S., and M. Ahlborn. Nutrition. Chapter XIII.
Rose, M. S. Foundations of Nutrition. Chapter XXVI.
Rose, M. S. Feeding the Family. Chapter VI.
Bogert, L. J. Nutrition and Physical Fitness. Chapter XXIII.

Infant

Chaney, M. S., and M. Ahlborn. Nutrition. Chapter XIV.
Rose, M. S. Foundations of Nutrition. Chapter XXVI.
Rose, M. S. Feeding the Family. Chapter VII.
Bogert, L. J. Nutrition and Physical Fitness. Chapter XXII.

Preschool child

Chaney, M. S., and M. Ahlborn. Nutrition. Chapter XV.
Rose, M. S. Foundations of Nutrition. Chapter XXVII.
Rose, M. S. Feeding the Family. Chapters VIII, IX.

School child

Chaney, M. S., and M. Ahlborn. Nutrition. Chapter XV.

Rose, M. S. Foundations of Nutrition. Chapter XXVIII.
Rose, M. S. Feeding the Family. Chapters X, XI, XII.
McCollum, E. V., E. Orent-Keiles, and H. G. Day. Newer Knowledge of Nutrition. Chapter XXVII.

Family groups

Chaney, M. S., and M. Ahlborn. Nutrition. Chapter XVI.
Rose, M. S. Foundations of Nutrition. Chapter XXIX.
Rose, M. S. Feeding the Family. Chapters III, XIV.
Sherman, H. C. Chemistry of Food and Nutrition. Chapters XXVI-XXVII.
McCollum, E. V., E. Orent-Keiles, and H. G. Day. Newer Knowledge of Nutrition. Chapter XXVI.

K. General References.

U. S. D. A. 1939 Yearbook, Food and Life. Pages 124-130; [illegible]; [illegible]; [illegible].

L. Supplementary questions for study and discussion.

Adult

1. Why is it important that a college student receive a daily adequate amount of all the essential nutrients?
2. What dangers are associated with severe underweight at the college age?
3. Why is it undesirable to make a practice of missing meals, and especially breakfast?
4. Make a list of all the reducing schemes in vogue among college students, analyze them nutritionally, and draw conclusions as to their effectiveness and nutritional safety.
5. Why is it undesirable to follow unintelligent reducing programs?
6. Make a list of the reducing suggestions given in the papers or on the radio, analyze them, and draw conclusions as to their effectiveness and nutritional safety.

Pregnancy and lactation

1. How does the basal metabolism during pregnancy compare with that of the non-pregnant woman? How do the total energy needs compare?
2. How does the protein requirement during pregnancy differ from that of the adult in quantity? in quality?
3. Of what special significance are calcium, phosphorus, iron, and iodine during pregnancy? How may these minerals be supplied in the diet most satisfactorily?
4. Of what importance are vitamins A and D, thiamin, ascorbic acid, and riboflavin in the reproductive process? How may each of these be supplied most satisfactorily?
5. What commonly occurring accompaniments of pregnancy may be related to nutrition?
6. What are the nutritional requisites during pregnancy?
7. What effect does lactation have upon the energy requirement? the protein requirement? the mineral requirement? the vitamin requirement?
8. Sometimes it is necessary to omit meat in the diet during pregnancy. How may the protein, iron, and thiamin furnished by the meat be made up in the diet?

Infant

1. Discuss the requirements of an infant for energy, protein, minerals, and vitamins.
2. Compare the qualities of human milk and cow's milk. Why is the former always recommended for the infant?

3. List the rules which should be observed in the feeding of infants.
4. At what age is an infant usually weaned? Why?
5. Discuss the various substitutes which may be used in place of mother's milk in infant feedings; their advantages and disadvantages.
6. What is meant by a proprietary food? What are the different classes available? What are the advantages and disadvantages of each?
7. Why is it necessary to modify cow's milk to be given to an infant? How is this done?
8. What is meant by an acid milk? Why is it given to infants?
9. Tabulate the foods besides milk which should be given to an infant during the first year, the form in which each is to be given, the age at which it is started, and the reasons for its addition.
10. What are the criteria of health in an infant?

Child

1. Why is the preschool period of such great importance in the life of the individual?
2. By what means may a good state of nutrition in children be determined?
3. How does the basal metabolism of a child compare with that of an adult? How do the total caloric needs compare?
4. Discuss the importance of diet for a child from the standpoint of quantity; of quality.
5. What factors are of importance for optimal growth in a child?
6. Is the quality of protein of more or less importance for a child than for an adult? Why? What happens to the protein requirement as the child grows older? When is a high-protein diet given to children?
7. What are the requirements of children for minerals? How are these requirements to be met most satisfactorily?
8. What actual experiments have been done to determine the iron requirement of children?
9. Describe the experiments carried on by Sherman and Hawley to prove that children need three to four glasses (cups) of milk daily.
10. Summarize the factors which determine whether or not food minerals will be completely absorbed and utilized.
11. What relationship exists between the vitamin content of the diet of children and their optimal well-being?
12. What are the effects of a suboptimal amount of vitamins in the diet of children?
13. How is diet related to proper intestinal hygiene in the child?
14. Summarize the information which is available regarding the relation of food to the nutrition of the teeth. What is the point on which there seems to be complete agreement? What are the points on which complete agreement is not reached?
15. List ways in which the school lunch may become an important factor in the optimal health of the school child.
16. Outline the points you would want to make in speaking to a group of mothers on the procedure to follow in feeding a child. What would you tell them concerning the child who will not eat?
17. List the foods and amounts which the preschool child should have daily and the reasons for the inclusion of each food in the diet.

Family

1. What is the first recognizable symptom of a diet which is limited in quantity or quality.

2. Summarize the information available concerning the adequacy of the American dietary. How is such information obtained?
3. What different plans may be used to insure the proper spending of the food dollar for nutritional adequacy.
4. What two underlying causes account for the gross deficiencies observed in human dietaries? How does each operate?
5. Describe observations on humans and animals which show how important food habits are for optimal well-being.
6. What methods are available to determine the adequacy of various diets?
7. How does the total amount of money spent on single items of foods, the preparation, and the service affect the adequacy of the food for the family?
8. Point out any relationships which exist between racial diets and racial health.

M. Problems.

1. "The Basic Seven," pages 9 and 10, provides guides for choosing one's daily food. The daily food groups suggested by these guides are listed in Table 50. The suggested number of servings from each group of foods constitute the "must haves" in the daily dietary or the essentials of a protective balanced diet to insure optimal nutrition for an individual. Additional amounts of any of these foods or other foods as fats and sweets may be added according to one's energy need and to make the diet still more varied.

1. Check on the nutritional adequacy of these guides by choosing representative and locally available foods from each group, calculating the nutritive values of the foods, and comparing the total figures with the recommended allowances for an adult (yourself or some other adult or both).

Does the list of foods chosen meet nutritionally the standards for an adult? Discuss.	
Does the list of foods meet your nutritional standards? Explain.	
Can the nutritional standards for an adult be met by always choosing the minimum number of servings suggested, for example, one serving instead of two?	
Can the recommended allowances be met when using the new chart that the National Nutrition Program has prepared? (See page 10).	

TABLE 50

Nutritive Value of Daily Food Guide

Food Group		Food Name and Weight	Food Measure	Cal.	Pro. gm.	Ca gm.	P gm.
Milk: 1 pt. adults 1 qt. children		16 oz.	2 glasses				
Tomatoes Oranges Grapefruit Raw cabbage Raw salad greens	1 or more servings	100 gm.					
		100 gm.					
Green or yellow vegetables, some raw, some cooked	1 or more servings	100 gm.					
		100 gm.					
Other vegetables, fruits Potato, other vegetables, fruits in season	2 or more servings, 1 of which is potato	Potato 150 gm.					
		100 gm.					
		100 gm.					
Bread and cereals	At least 2 servings of whole-grain or enriched	Bread 60 gm.	2 slices				
		Cereal 30 gm. dry wt.					
Egg	1, or at least 3-4 per week	50 gm.	1 egg				
Lean meat, poultry, fish	1 or more servings	90 gm.					
		90 gm.					
Butter and other vitamin-rich fats		1 oz.					
		1 oz.					
Sweets							
Water	6 or more glasses						
Totals							
Recommended allowances for an adult							
Recommended allowances for college student							

Fe mg.	Vit. A I.U.	Thiamin mg.	Ascorbic acid mg.	Riboflavin mg.	Nicotinic acid mg.	Fiber mg.	Acid	Base

2. The college student's diet.

   a. Using "Eat the Right Food" or "Eat Nutritional Food," plan a moderate-or minimum-cost adequate diet which meets in all respects the nutrition standards for the average college student. Record data in Table 51.

Discuss each of the following points in relation to the diet planned

Distribution of calories between protective and other foods	
Choice of cereals among the refined, unrefined, and enriched products	
Choice of protein foods between animal and vegetable proteins	
What changes will you make in the diet to make it satisfactory as a reducing diet for the college student?	
What points would you stress in discussing a reducing diet if complete nutritional adequacy is to be attained?	
What are some of the dangers involved in following some of the popular reducing diets?	

TABLE 51

Diet for College Student

Age ______ Ht. ______ Ft. ______ In. ______ Ave.wt. ______ lb. ______ kg.

Food	Amounts		Cal.	Pro. gm.	Ca gm.	P gm.	Fe mg.	Vitamins				Cost
	Meas.	Wt. E.P. gm.						Vit. A I.U.	Thiamin mg.	Ascorbic acid mg.	Riboflavin mg.	

b. Make a study of one week's dietary to determine its nutritional adequacy for the average college student. This dietary may be a popular reducing regimen, the dietary served in the college dining-hall, sorority, or cooperative house, or a dietary eaten by a non-home-economics student. Use Table 52, one sheet for each day. This problem may be an individual one or a group one. Should the dietary dealing with the reducing regimen be chosen, each student or small group of students might choose a different popular reducing diet.

Reducing regimen

(1) Secure one week's menus suggested for reducing, and record in Table 52.
(2) Calculate the daily food values of this set of menus.
(3) Determine the average weekly values for calories, protein, minerals, and vitamins.
(4) By bar graphs in Fig. 22, compare the average nutritional requirements of the college student and the average figures for the nutritive values of the reducing regimen.

College dining-room, sorority, or cooperative-house menus or one week's dietary of a non-home-economics student.

(1) Secure, from the dietitian in charge of the college dining-hall or sorority or cooperative house, one week's menus with the approximate amounts of each food allowed per serving; or the actual amounts of each food served on the menu may be secured by having a student go to the kitchen at mealtime and weigh the foods of a sample meal.

If a non-home-economics student's dietary is chosen for this study, have the student record all foods and beverages eaten for one week and transfer to Table 58.

(2) Proceed as above in (2) (3) (4) above.

What conclusions can be drawn from the above study?	
Make constructive suggestions in regard to the dietary studied.	

TABLE 52

Food	Amounts		Cal.	Pro. gm.	Ca gm.	P gm.	Fe mg.	Vitamins				Cost
	Meas.	Wt. E.P. gm.						Vit. A I.U.	Thiamin mg.	Ascorbic acid mg.	Riboflavin mg.	

TABLE 52

Food	Amounts		Cal.	Pro. gm.	Ca gm.	P gm.	Fe mg.	Vitamins				Cost
	Meas.	Wt. E.P. gm.						Vit. A I.U.	Thia- min mg.	Ascor- bic acid mg.	Ribo- flavin mg.	

TABLE 52

Food	Amounts		Cal.	Pro. gm.	Ca gm.	P gm.	Fe mg.	Vitamins				Cost
	Meas.	Wt. E.P. gm.						Vit. A I.U.	Thiamin mg.	Ascorbic acid mg.	Riboflavin mg.	

TABLE 52

Food	Amounts		Cal.	Pro. gm.	Ca gm.	P gm.	Fe mg.	Vitamins				Cost
	Meas.	Wt. E.P. gm.						Vit. A I.U.	Thiamin mg.	Ascorbic acid mg.	Riboflavin mg.	

TABLE 52

Food	Amounts		Cal.	Pro. gm.	Ca gm.	P gm.	Fe mg.	Vitamins				Cost
	Meas.	Wt. E.P. gm.						Vit. A I.U.	Thiamin mg.	Ascorbic acid mg.	Riboflavin mg.	

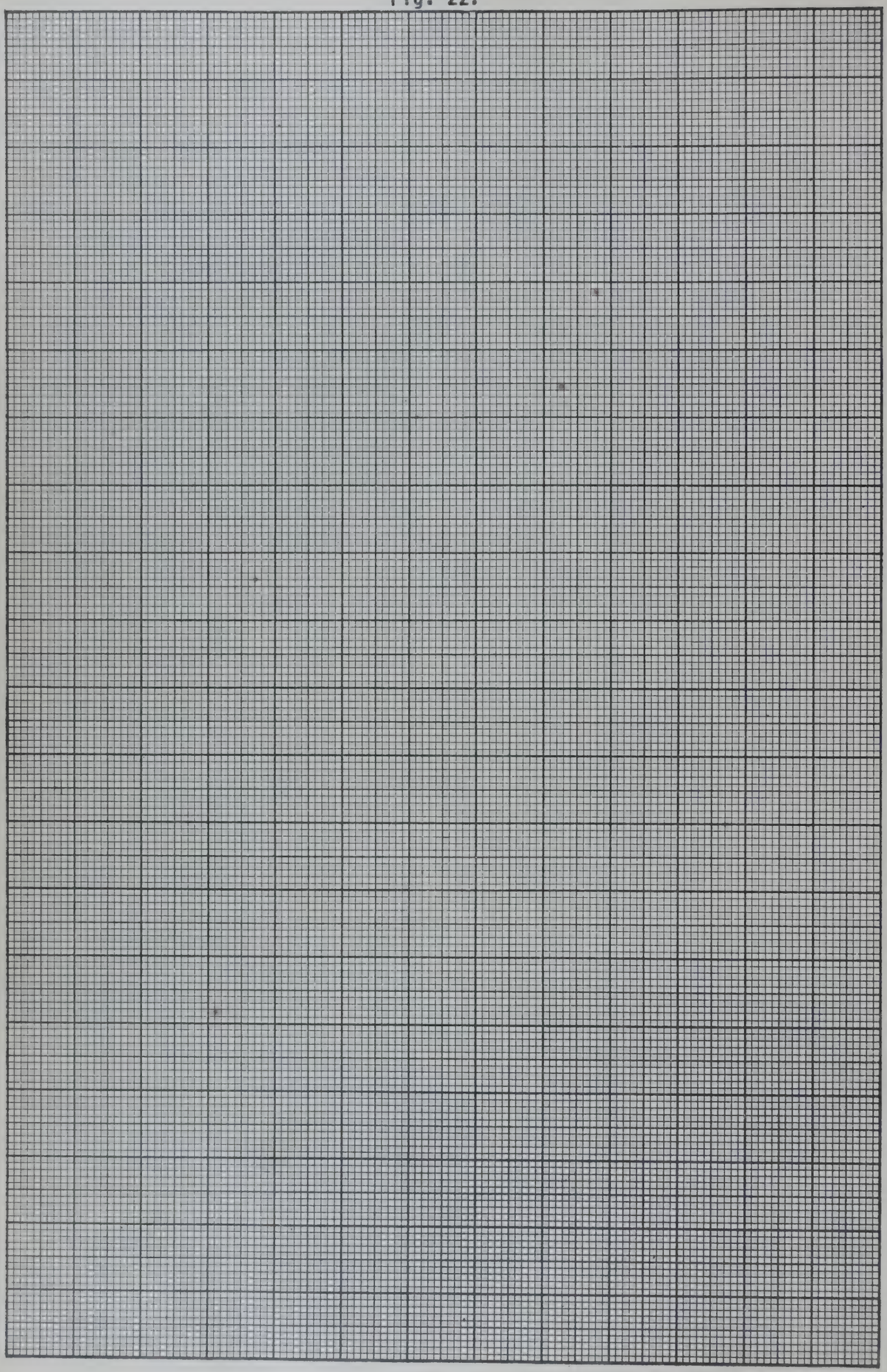
TABLE 52

Food	Amounts		Cal.	Pro. gm.	Ca gm.	P gm.	Fe mg.	Vitamins				Cost
	Meas.	Wt. E.P. gm.						Vit. A I.U.	Thia-min mg.	Ascor-bic acid mg.	Ribo-flavin mg.	

TABLE 52

Food	Amounts		Cal.	Pro. gm.	Ca gm.	P gm.	Fe mg.	Vitamins				Cost
	Meas.	Wt. E.P. gm.						Vit. A I.U.	Thiamin mg.	Ascorbic acid mg.	Riboflavin mg.	

Fig. 22.



3. Adequate diet during pregnancy and lactation.

a. Plan a day's dietary for a normal pregnancy - sixth to ninth month - which will furnish the optimal daily nutritional requirements suggested by Burke[1] and will follow the minimum protective diet suggested by Wegner.[2] Record data in Table 53.

What changes will have to be made in the diet planned to insure adequacy of protein in quality and quantity, as well as of iron and of thiamin, if it is necessary to eliminate meat and eggs?	
b. If you were asked to write a leaflet, "Diet during Pregnancy and Lactation" which could be distributed at a prenatal clinic, what points would you stress? Make an outline for such a leaflet.	

[1] B. S. Burke. "The Need of Better Nutrition during Pregnancy and Lactation." Jour. Am. Diet. Assoc.: 17, 102, 1941.

[2] C. R. Wegner. "Diet in Pregnancy and Lactation." Jour. Am. Diet. Assoc.: 16, 541, 1939. Children's Bureau. Prenatal Care. Publication 4. Revised, 1942.

TABLE 53

Diet During Pregnancy

Food	Amounts		Cal.	Pro. gm.	Ca gm.	P gm.	Fe mg.	Vitamins				Cost
	Meas.	Wt. E.P. gm.						Vit. A I.U.	Thia-min mg.	Ascor-bic acid mg.	Ribo-flavin mg.	

c. Plan a series of six lessons on nutrition during the prenatal period to be presented to a prenatal group in a clinic or visiting nurses center. Give the title of each lesson, outline one of the six lessons in detail, and be prepared to present this lesson to the class as it would be given to the prenatal group.

4. Adequate diet for the infant and preschool child.

   a. Determine the nutritive value of human milk a normal infant of 2½ months should receive. Record data in Table 54.

TABLE 54
Nutritive Value of Breast Feeding

Age of Infant	Wt. of Infant	Amount Breast Milk	Carb. gm.	Fat gm.	Pro. gm.	Cal.
	Totals					
	Gm. per lb.					
	Standards per lb.					

   b. Calculate the milk modification formula for an infant girl of 3½ months or an infant boy of 5 months. Record data in Table 55.

TABLE 55
Milk Modifications for Infants of Different Ages

Infant	Formula and other foods	Carb. gm.	Fat gm.	Pro. gm.	Ca gm.	Cal.
	Milk					
Age	Sugar					
Wt.	Water					
No. of feedings						
	Totals					
	Gm. per lb.					
	Standard per lb.					

   c. Compare the cost of the above formula for a week when it is made with certified milk, dextrimaltose, vitamin C given in the form of cevitamic acid, and D as viosterol, with that made with grade A or B milk, ordinary sugar, C in the form of tomato juice, and D in a standard cod-liver oil. Record data in Table 56.

TABLE 56
Comparison of Cost of Formulas for Infants

Food	Formula 1		Formula 2	
	Kind of Food	Cost	Kind of Food	Cost
Milk	Certified		Grade B	
Sugar	Dextrimaltose		Cane sugar	
Vitamin C	Cevitamic acid		Tomato juice	
Vitamin D	Viosterol		Cod-liver oil	
	Total		Total	

   d. How much would the above formula cost if made with evaporated milk instead of fresh milk?

e. List the foods which are added to the infant's diet during the first year, giving the time, the amount, and the reasons for the additions. Record data in Table 57.

TABLE 57

Foods Added to Infant's Diet during the First Year

Time	Food	Amount	Reasons

f. What nutritional standards should be followed in choosing foods for the preschool child?

Special references.

Children's Bureau.
"Infant Care." Publication 8. Revised, 1942.
"The Child from One to Six." Publication 30. 1942.
"The Health of the Child is the Power of the Nation." Series of Folders.
"The Road to Good Nutrition." Publication 270. 1942.
Jeans, P. C. "Handbook of Nutrition. XIX. Feeding Healthy Children." Jour. Am. Med. Assoc. 120, 913, 1942.
Butler, A. M. "Nutritional Requirements in Infancy and Childhood." Am. Jour. Dis. Child.: 64, 898, 1942.

g. List the foods and amounts which should be in the daily diet of the preschool child. Indicate the chief nutritional values of each food.

h. Plan two days' menus for the child who does not like to drink milk, using 3 cups of milk daily. Indicate amount of milk in each dish.

TABLE 58

Foods with Milk for the Child

	Breakfast	Dinner	Supper
1st day			
2nd day			

5. Adequate diet for the school child.

a. Plan a day's dietary which will meet the nutritional requirements of a boy or girl of 8 years or a boy or girl of 15 years. Write menu below, and record data in Table 59.

TABLE 59

Diet for the School Child

Sex ________ Age ________ Ht. ________ Ft. ________ In. Ave.wt. ________ lb. ________ kg.

Food	Amounts		Cal.	Pro. gm.	Ca gm.	P gm.	Fe mg.	Vitamins				Cost
	Meas.	Wt. E.P. gm.						Vit. A I.U.	Thiamin mg.	Ascorbic acid mg.	Riboflavin mg.	

b. Plan 10 different consecutive lunches which would be nutritionally adequate and practical for children to carry to school.

TABLE 60

Lunches to Carry to School

6. Adequate diet for the family.

   a. Plan a moderate-cost or a low-cost adequate dietary for 1 week for your own family or for a family of four or five.

      (1) Determine and tabulate in Table 61 the nutritonal requirements for each of the members of the family.

TABLE 61

Nutritional Requirements of a Family

Member of family	Cal.	Pro. gm.	Ca gm.	P gm.	Fe mg.	Vit.A I.U.	Thiamin mg.	Ascorbic acid mg.	Riboflavin mg.
Father (mod. act.) Mother (mod. act.) Boy yr. Girl yr.									
Totals for day									
Totals for week									

      (2) Determine the weekly food needs of each member of the family and the totals for the whole group at one of the Bureau of Home Economics low-cost adequate levels or the moderate-cost adequate level.[1] Record weekly food needs in Table 62.

      Which of the 12 kinds of foods are more prominent in a low-cost adequate diet? Why?

      Which are more prominent in the moderate-cost adequate diet?

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[1] Bureau of Home Economics.
"Three Market Lists for Low-Cost Meals." Revised October, 1942.
"Market Lists for Moderate-Cost and Liberal Meals." Revised, October, 1942.
NOTE: Market order to accompany Table 62 will be planned in Unit Six.

Food Needs for a Family for One Week

Member of family	Kinds and Quantities of Foods for a Week											
	Milk	Potatoes, sweet potatoes	Dried peas, beans, nuts	Tomatoes, oranges, grapefruit	Leafy, green, yellow vegetables	Other vegetables, fruit	Eggs	Lean meat, poultry, fish	Flour cereals	Fats and oils	Sugars, sirups, preserves	Miscellaneous
	qt.	lb.oz.	lb.oz.	lb.oz.	lb.oz.	lb.oz.	number	lb.oz.	lb.oz.	lb.oz.	lb.oz.	lb.oz.
Totals for the week												

Unit Six

BUYING FOOD FOR GOOD NUTRITION

Previous units have dealt with the need for specific nutrients for good nutrition as well as with guides for the daily choice of foods which will provide these nutrients. It is the purpose of this unit to consider how the nutritional needs can be met at the lowest possible cost.

The selection of the daily foods on the basis of their nutritional contributions is an important consideration for every individual but particularly so when the income is limited. Good nutrition is attainable at a low as well as at a high income level, but greater care needs to be exercised in the choice of foods at the lower level. Good management and planning, careful buying and care of foods, as well as correct preparation and cooking to conserve nutritive values bring greater returns in nutrition for every dollar spent.

Bureau of Home Economics studies have revealed that, in families spending approximately the same amount of money per meal, one-half as many people received poor diets as good ones. Today more than ever before it is necessary to know how to reduce food costs without losing any of the palatable and nutritive qualities and how to choose the less expensive but equally nutritious forms of food within each of the food groups.

The amount of money to be spent at different income levels varies with certain factors, but, in general, the lower the income, the greater the proportion spent for food. The amount of money spent for food is not always an indication of adequacy; it is possible to spend a great deal of money without buying all the essentials for good nutrition. Food costs can be materially reduced without nutritional sacrifice by using more of the less-expensive food groups, by choosing the less -expensive foods in each group, by devising ways of using all edible parts of foods, and by careful preparation of the food in the kitchen. Planning before buying, shopping around for the best buys, comparing food prices, buying in quantities when conditions permit, reading labels, buying by weight and grade, and checking purchases and weights are a few desirable procedures to follow in marketing for food.

Various plans are suggested for the division of the food dollar among the food groups. One such plan recommends the division of the food dollar into fifths, spending approximately one-fifth for milk and cheese, one-fifth for fruits and vegetables, one-fifth for meat, fish, and eggs, one-fifth for bread flours and cereals, and one-fifth for fats, sugars, and accessories. Still another suggests spending as much money for milk, cream, and cheese as for meats fish, and poultry, and as much for vegetables and fruits as for meats, fish, and poultry.

Outline of Unit

A. The food budget.

   1. Proportion of the income to be spent for food.
   2. Division of the food money among the food groups.

B. General buying procedures.

C. Procedures and economies in buying foods in the various food groups.

D. Textbook references.

Bogert, L.J. Nutrition and Physical Fitness. Chapter XXII.
Sherman, H.C. and C.S. Lanford. Essentials of Nutrition. Chapter XX.

E. General references.

Brindze, R. Stretching your Dollar in Wartime. Vanguard Press. 1942.
Brown, A.C. Consumer Interests-Selection of Food in Relation to Quality and Price. Burgess Publishing Company. 1943.
Bureau of Home Economics. "Market Lists for Low-Cost, Moderate-Cost, and Liberal-Cost Meals." October 1942.
Hotchkiss, A.S., F. Fenton, and D. Brusher. "Buying Food for the Family." Cornell Extension Bulletin 526. 1942.
Justin, M.M., L.O. Rust, and G. Vail. Foods. Unit Four.
Margolius, S. How to Buy More for Your Money. Modern Age Books. 1942.
Monroe, D., H. Kyrk, and U.B. Stone. Food Buying and Our Markets. M. Barrows. 1939.
Robertson, E., S. MacLeod, and F. Preston. What Do We Eat Now: A Guide to Wartime Housekeeping. J.B. Lippincott. 1942.

F. Problems.

1. Translate the weekly food needs of the family (Table 62) into a market order, using Table 63 for this purpose. Obtain the price of the market order in your community, observing all the economies possible in the selection of the foods.

   How is the cost of the market order affected by shopping in different types of stores as chain, independent, and super market?

Note: Menus to accompany the market order will be planned in Unit Seven.

TABLE 63

Form for Recording the Weekly Marketing Order

Total amount needed for week	Kinds of foods	Foods to be bought		Cost per pound, can, package, bag, etc.	Amount in can, package, bag, etc.	Total cost of amount purchased
		Kind	Amount			
	1. Milk and Milk Products Fresh or fermented Fluid milk Fluid milk equivalents Canned Dried Cheese American Cottage					
	2. Potatoes White Sweet					
	3. Dried peas, beans, nuts Beans, kidney navy lima baked soy Peas, green, split Beanut butter Lentils					
	4. Tomatoes, citrus fruits Tomatoes Canned Juice Oranges Fresh Canned juice Grapefruit Fresh Canned Canned juice					

TABLE 63

Form for Recording the Weekly Marketing Order (Continued)

Total amount needed for week	Kinds of foods	Foods to be bought		Cost per pound, can, package, bag, etc.	Amount in can, package, bag, etc.	Total cost of amount purchased
		Kind	Amount			
	5. Leafy, green or yellow vegetables Spinach Cabbage Kale Escarole Chard Carrots Rutabagus Hubbard squash Broccoli Green beans					
	6. Other vegetables and fruits Onions Beets Cauliflower Corn (canned) Apples Bananas Prunes Apricots Raisins					
	7. Eggs Fresh Cooking					
	8. Lean meat, poultry and fish Beef, hamburg chuck liver round					

TABLE 63

Form for Recording the Weekly Marketing Order (Continued)

Total amount needed for week	Kinds of foods	Foods to be bought		Cost per pound, can, package, bag, etc.	Amount in can, package, bag, etc.	Total cost of amount purchased
		Kind	Amount			
	8. Lean meat, poultry and fish (continued) Lamb, breast shoulder leg liver Pork, shoulder loin liver Veal, shoulder breast leg Fish, fresh cod haddock mackerel flounder Fish, canned salmon sardines Fish, salt cod mackerel Kidney Brains Heart					
	9. Flours, bread, cereals Flour, enriched whole-wheat Cereals, cornmeal barley dark farina oatmeal brown rice white rice shredded wheat					

TABLE 63

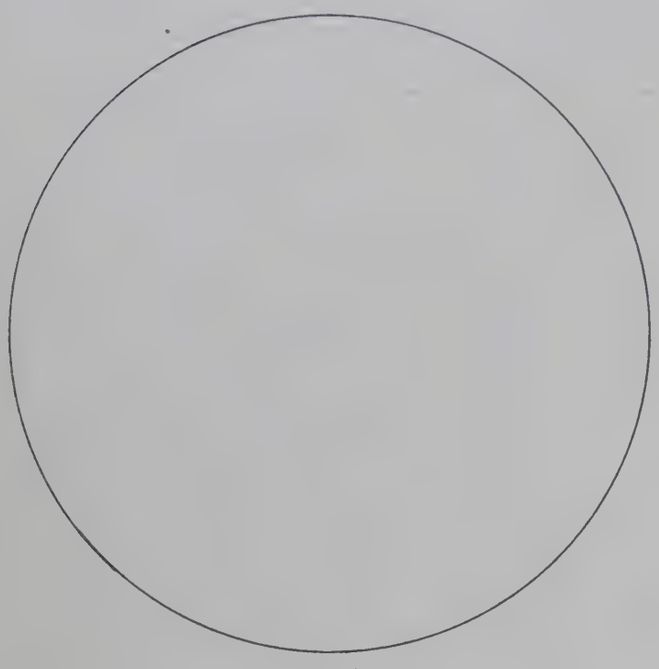
Form for Recording the Weekly Marketing Order (Continued)

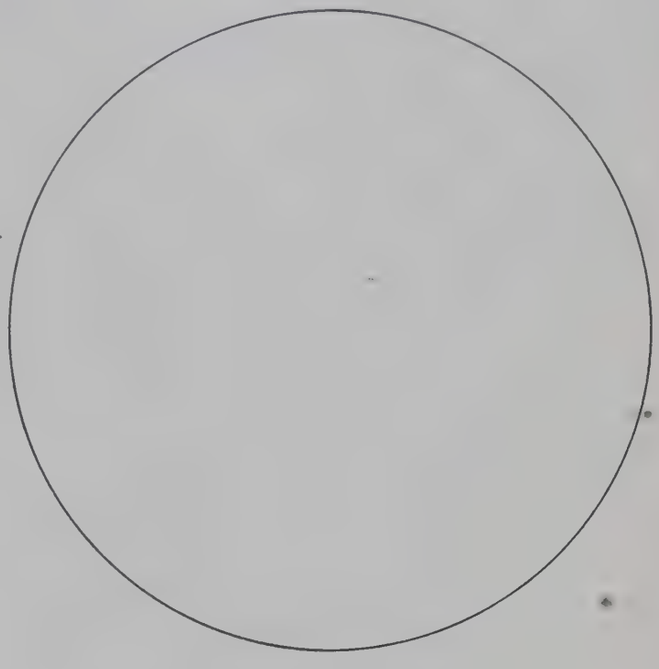
Total amount needed for week	Kinds of foods	Foods to be bought		Cost per pound, can, package, bag, etc.	Amount in can, package, bag, etc.	Total cost of amount purchased
		Kind	Amount			
	9. Flours, bread, cereals (continued) Breads, enriched whole-wheat rye Crackers, Graham whole-wheat					
	10. Fats and Oils Butter, print tub Oleo, A fortified Lard Oil, vegetable					
	11. Sugars, sirups, preserves Sugar, granulated brown Molasses Sirups, corn maple					
	12. Miscellaneous Coffee Tea Cocoa Salt Baking powder Vinegar					

2. Complete the following circle graphs to show:

   a. Any authoritative suggested division of the food dollar (indicate authority)

   b. Division of the food dollar on your market order (Problem 1)





3. What is the cheapest way to buy a quart of milk?
   a. List below the various forms of milk which are available in your community (include bottled and cartoned certified, pasteurized, raw, and evaporated and dried milks)
   b. Calculate the cost of 1 quart of milk in each of the forms available.

TABLE 64

Cost of Various Forms of Milk

Forms	Cost per quart	Remarks

   c. What conclusions can you draw from the above study?

4. Develop below a problem similar to Problem 3 regarding some food or foods in one of the other food groups in "The Basic Seven."

5. In September, 1945, each of the following lists of foods could be purchased in the New York area for approximately $1.35.
Calculate the nutritive value of each group of foods, and compare graphically in Fig.27.
If you prefer, you may make up two similar lists using foods available and current prices in your own community.

List 1	List 2
1 lb. beef liver	1 lb. round steak
1 loaf whole-wheat bread	1 package frosted peas
1 lb. fortified oleomargarine	1 loaf white bread
1 tall can irradiated evaporated milk	1/2 lb. butter
2 lb. potatoes	1 package (8 oz.) potato chips
1 No.2-1/2 can tomatoes	
1 bunch carrots	
1 lb. spinach	

b. What conclusions can you draw from the above study?

6. Certain procedures and economies in buying foods in each of the food groups bring greater returns from the food dollar. Fill in Table 65.

Fig. 23. WISE AND UNWISE FOOD EXPENDITURE

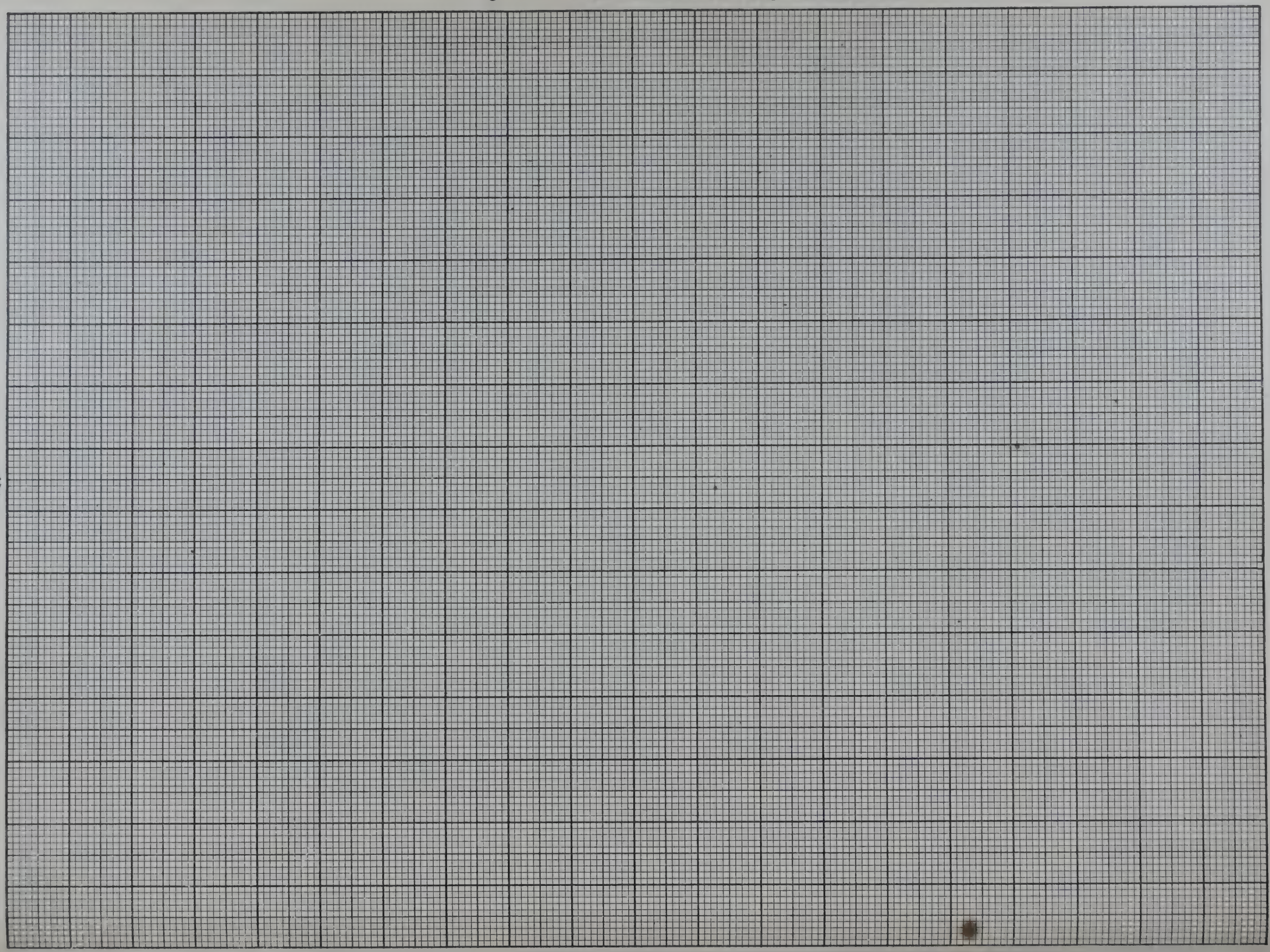


TABLE 65

Procedures and Economies in Food Buying

Food group	Buying procedures and economies

Unit Seven

MEAL PLANNING AND FOOD PREPARATION

The average individual consumes yearly approximately one thousand meals and spends about one-fifth of his income for food. The three meals eaten every day must contain sufficient amounts of all the nutrients now known to be necessary in the human dietary. This is not the entire story, however. The combination of the foods into meals which will be economical, attractive, and appealing, and the preparation of these same foods in such a way that their nutritive value will be conserved and their palatability and digestibility insured, are also important considerations in the study of nutrition and dietetics. The importance of environmental factors and of the proper digestion and use of food by the body has already been stressed.

It is almost impossible as well as unnecessary for the average person so to plan each meal that it will supply a definitely prescribed amount of each of the food constituents. The one-time much-overworked term "balanced meal" has, therefore, lost its implied meaning of furnishing an exact amount of each of the foodstuffs at each and every meal. In its newer and broader sense, the term signifies the provision at each meal of a well-selected variety of foods which will represent the various nutrients and furnish a part of the day's requirement for each. In the course of the day, such carefully selected meals will offer a sufficient amount of all the nutrients and will thus provide for the nutritional needs of the body. They will also insure the presence in the diet of sufficient amounts of the "protective foods."

With "Eat the Right Food" or "Eat Nutritional Food" as a guide for choosing a diet which will be satisfactory nutritionally, the next consideration is the combination of foods within each meal so that this diet will be equally satisfactory esthetically. It is not difficult to see that a perfectly planned meal as far as the principles of nutrition are concerned might be a most unattractive and unpalatable one. Appearance and service of a dish and a meal are greater factors in its proper enjoyment and use than is often realized.

It is possible to meet nutritional needs with no variety in the foods served, but the old saying "variety is the spice of life" certainly holds true in menu construction. Variety in the combination of foods, methods of preparation, and serving does much to tempt the appetite and relieve the monotony of the ordinary diet. Interest in meals may be obtained in many ways: by paying attention to the different methods of preparation; by combining the different flavors, colors, textures, and forms of foods; and by the use of garnishes.

Outline of Unit

A. Combination of foods for the day into meals.

1. Nutritional considerations.
2. Esthetic considerations.
3. Economic considerations.

B. Building menus by the day, week, season.

C. Score card for menu planning.

D. A guide for daily meal planning.

E. Influence of cooking processes on nutritive value.

F. Preservation of nutritive values in cooking.

G. Textbook references.

Rose, M.S. Foundations of Nutrition. Chapter XXV.
Bogert, L.J. Nutrition and Physical Fitness. Chapters XX, XXI.
Rose, M.S. A Laboratory Handbook for Dietetics. Pages 43-44.

H. General references.

Dowd, M.T., and A. Dent. Elements of Foods and Nutrition. Chapter XX.
Fonman, E. "Handbook of Nutrition. XV. The Preservation of Nutritive Values of Foods in Processing." Jour. Am. Med. Assoc.: 120, 831, 1942.
Rose, M.S. Feeding the Family. Chapter IV.

I. Supplementary questions for study and discussion.

1. Why is it important that we give a prominent place to protective foods in menu planning? How did these particular foods receive this designation?
2. Distinguish between adequate and optimal diets.
3. Why should meals be planned in not less than day (3-meal) units?
4. Why is it important that we pay some attention to the esthetic needs when planning meals?
5. From the standpoint of the actual preparation of foods, what points need to be considered when planning meals?
6. How is the order of foods in the various meals justified?
7. How do menus vary from season to season?
8. How, in general, do menus of low-cost diets differ from those of moderate cost? moderate cost from those of unlimited or liberal cost?
9. List the kinds of soups to serve with heavy dinners; with a luncheon.
10. List desserts and salads to serve with a heavy meal; with a light meal.
11. What is the newer interpretation of the term "balanced meal"?
12. How may losses of food value in cooking be minimized?
13. How can the attractive colors of vegetables be retained during the cooking processes?
14. How can original flavors be retained during the cooking processes?

J. Problems.

1. Use of score card in planning and evaluating menus.
The following score card may be found helpful in planning and evaluating menus.

TABLE 66

Score Card for Menu Planning

Nutritional Requirements	.75
Are all principles of nutrition represented?	
Energy - is it adequate for the type of meal?	15
Protein - is it suitable in kind and amount?	10
Minerals - are Ca, Ph, and Fe represented?	10
Vitamins - are vitamins A, B, C, and G present?	10
Are the protective foods well represented?	10
Is the choice of food good for bulk?	10
Is the choice of food good for digestion?	10
Esthetic Requirements	.25
Is there variety in foods and preparation?	5
Is there pleasing contrast in flavor?	5
Is there pleasing contrast in color?	5
Is there a contrast in consistency?	5
Is there a contrast in form?	5
Total points	100

a. List the foods which you ate at your last meal. Menu

b. Score this meal by means of the above score card. Score _____

2. "The Basic Seven," pages 9 and 10, as guides in meal planning. The following table is an adaptation of government daily food guides to aid in the planning of meals.

TABLE 67

A Guide to Daily Meal Planning

Adapted from "Eat the Right Food" and "Eat Nutritional Food"

Number	1*	2*	3*	4*
Group of food to use daily	Milk and milk products	Vitamin C rich fruits and vegetables	Leafy, green or yellow vegetables	Other fruits White potatoes
Amounts to use per person per day	1 qt. per child 1 pt. per adult	1 or more servings	1 or more servings per person	1 or more servings
Kinds of foods	Serve as: Milk to drink whole skim buttermilk Milk beverages cocoa malted milk chocolate milk Cream soups Cream sauces Escalloped dishes Desserts custards puddings ice cream On cereals On desserts Dired and evaporated milk Cheese, American cottage Equivaltents 1 qt. fresh whole milk = 1 qt. milk + 1½ oz. butter. =17 oz. evaporated milk (tall can = 14½ oz.) =4½ oz. dried whole milk. =3½ oz. dried skim milk + 1½ oz. butter. =5 oz. cheese.	Tomatoes and juice Oranges and juice Grapefruit and juice Strawberries Cantaloup Cabbage, raw Green peppers Raw apples, if eaten liberally Raw salad greens Lemons Limes Use any fruit as dessert at any meal.	Green vegetables: Asparagus Brussels sprouts Cabbage Chard Spinach Dandelion greens Beet tops Endive Lettuce Romaine Watercress Chicory Turnip tops Radish tops Dock Sorrel Green onions with tops Green beans Peas Okra Peppers Mustard greens Escarole Yellow vegetables: Carrots Rutabagus Sweet potatoes Yellow squash Pumpkin	Serve: Baked Scalloped Mashed Creamed Puff Croquettes Pan fried

* Protective foods.

	5	6	7	8
and vegetables Fruits and vegetables in season	Whole grain or enriched bread and cereals	Lean meat, poultry, and fish, or alternates	Eggs	Butter and vitamin-rich fats Sweets
2 servings	At least 2 servings	1 or more servings 1 from group 1 1 from group 2 or 3 if desired	1 per day or at least 3-4 per week	Amounts to make diet palatable and meet energy needs
Vegetables: Beets Cauliflower Celery Onions Parsnips White turnips Wax beans Eggplant Kohlrabi Celery root Salsify Fruits: Fresh or canned: Apples Banana Berries Cherries Peaches Pears Pineapple Rhubarb Watermelon Cantaloup Honeydew melon Dried: Figs Prunes Raisins Dates Use any fruit as dessert at any meal.	Breads: Whole-wheat Enriched Whole rye Cereals: Oats, oatmeal Whole-wheat: shredded puffed cracked Dark farina Other dark cereals Brown rice Wheat germ Cereal products: Waffles Muffins Griddlecakes made with enriched, whole-wheat or graham flour	Group 1: Lean meat Fish Poultry (Use liver and kidneys frequently.) Group 2: Beans, dried kidney lima navy soy Lentils Peas (Dry beans or peas may take place of meat 1-2 days a week if desired) Group 3: Cheese	Serve: Poached Coddled Hard or soft cooked Shelled Creamed Scrambled Deviled	Fats: Butter Cream Fortified margarine Bacon Salad oils Salt pork Sweets: Ice cream Simple desserts Dried fruits Brown sugar Honey Molasses

Outline below three different plans or skeleton menus to include all the required foods in the daily diet. Use Table 67 as a guide.

TABLE 68

Plans for Including the Daily Foods for Good Nutrition

Food to include in the daily diet	Skeleton Menus		
	Plan 1	Plan 2	Plan 3
		Breakfast	
		Lunceon or Supper	
		Dinner	

3. By means of the score card for menu planning, score each of the following meals. If the score is low, suggest ways of improving the menu.

TABLE 69

Scoring of Meals

Menu	Score	Menu	Score
Macaroni and cheese Buttered string beans Head lettuce salad with Russian dressing Whole-wheat bread and butter Baked apple with raisins Milk		Cranberry juice Swiss steak Scalloped potatoes Buttered whole carrots Salad of greens with French dressing Bran muffins and butter Peach tarts	
Cream of tomato soup Fried pork chops Fried sweet potatoes Baked Hubbard squash Bread and Butter Pumpkin pie		Cold ham Potato salad Baked beans Brown bread and butter Apple pie	
Scalloped salmon Potato croquettes Creamed turnips Clover-leaf roll and butter Apple sauce Gingerbread		Bananas Cream of wheat with top milk and sugar Baking-powder biscuits with butter and marmalade Cocoa	
Vegetable plate of broccoli with mock Hollandaise sauce Creamed celery Baked Hubbard squash Mashed turnips Cabbage and carrot salad Chocolate cake		Fruit cup in grapefruit halves Chicken croquettes Stuffed baked tomato Spinach timbale Rolls and butter Moulded vegetable salad Individual steamed chocolate pudding, hard sauce	

4. Menus

a. Plan a week's menus for the present season to accompany the moderate-cost, or low-cost weekly market order for the family, as outlined in Unit Five, Problem 6, which will illustrate the important points in menu planning. Write menus correctly and in the proper order in Table 70a.

b. Plan a week's menus for a college girls' dormitory, sorority, or cooperative house, observing the yardstick for good nutrition and the rules for good menu planning. Use Table 70b.

TABLE 70a

Menus for a Family for One Week at Cost

Meal	Monday	Tuesday	Wednesday
Breakfast			
Luncheon or supper			
Dinner			

Thursday	Friday	Saturday	Sunday

TABLE 70b

Menus for a College Group for One Week at Cost

Meal	Monday	Tuesday	Wednesday
Breakfast			
Luncheon or supper			
Dinner			

Thursday	Friday	Saturday	Sunday

c. Plan five consecutive carried lunches satisfactory for a commuting college girl or secure several luncheon menus from the cafeteria patronized by the students and select from each several well-chosen food combinations for the average amount of money which is spent for lunch in your college community.

d. Study the nutritional adequacy and esthetic values of lunches chosen in the college cafeteria by men and women faculty members, men and women college students, and employees; summarize in some acceptable form below.

5. Plan eight to ten simple meals for four persons which will include the various food groups, illustrate good meal planning, and cost between 25 and 35 cents. Record data in Table 71.

TABLE 71

Nutritious Meals at Low Cost

Dishes on Menu	Ingredients						Total cost of meal
	Food	Meas.	Wt. gm. or oz.	Purchase unit Type and weight	Cost of purchase unit	Cost of amount used	

TABLE 71

Nutritious Meals for Four at Low Cost (continued)

Dishes on Menu	Ingredients						Total cost of meal
	Food	Meas.	Wt. gm. or oz.	Purchase unit Type and weight	Cost of purchase unit	Cost of amount used	

6. Correct preparation of food is necessary to insure the maximum retention of nutritive value.

   List below for each food group some procedures to follow in the preparation and serving of food and also certain economies which might be effected in food preparation.

TABLE 72

Procedures and Economies in Food Preparation

Food group	Cooking procedures	Economies in cooking

Unit Eight

EVALUATION OF FOOD AND NUTRITION INFORMATION
FADS AND FALLACIES
PRINTED MATERIAL

The old saying that "a little knowledge is a dangerous thing" very aptly explains many of the queer and vague ideas concerning food and food habits which appear from time to time. Because they cannot be explained scientifically, they may rightly be called fallacies. Some have been handed down from one generation to another; others have arisen with each new discovery regarding food and nutrition; many have been the result of commercial advertising of products; and a large share are conspicuously promoted by a group of people known as food faddists. Part of nutrition study must prepare one to understand and combat these fallacies in the light of authentic scientific information.

Perhaps the most numerous and also oldest are those fallacies concerning the combination of foods. Most dangerous to health are the fallacies dealing with the loss of weight, the need for which should be determined by the physician rather than fashion, the diet being planned by the nutritionist rather than by commercial or cultic sources. Acidosis fallacies have arisen because of the use of this term without any idea of its true meaning. Other fallacies have to do with the theory that roughage must be stressed in the diet, with the placing of undue emphasis on one particular kind of food, with the idea that certain foods will cause either a loss or gain in weight, and with the vegetarian and nut diets. The proponents of this or that fad or fallacy would have one believe that it is impossible to obtain all the essential nutrients from a well-selected diet of milk, fruits, vegetables, eggs, and other foods. Science has taught us that it is not necessary to buy this or that "health food" or follow this or that "health system" to acquire good health. Given a properly functioning body and desirable environmental conditions to start with, a knowledge of the food principles and their functions in the body, along with the ability to choose the right kinds and amounts of the easily available foods to furnish these essentials, is the answer to good health via good nutrition.

The vast amount of printed material on food and nutrition accumulating from commercial sources likewise requires a careful evaluation if it is to be used intelligently. Such material needs to be checked before use for accuracy and timeliness of subject matter, methods of presentation, and educational value.

Outline of Unit

A. Recognition and scientific appraisal of food and nutrition fads and fallacies.

B. Evaluation of printed material on food and nutrition.

C. Construction of exhibits dealing with fads and fallacies.

D. Activities of agencies interested in the advertising of food products.

E. Textbook references.

Bogert, L. J. Nutrition and Physical Fitness. Chapter XXIII.

F. General references.

American Medical Association. Accepted Foods.
Bogert, L. J. Diet and Personality. Chapters XIV, XV.
Dowd, M. T., and A. Dent. Elements of Foods and Nutrition. Chapter XXII.
Fishbein, M. Your Diet and Your Health. Chapters V, VI.
McCollum, E. V., E. Orent-Keiles, and H. G. Day. Newer Knowledge of Nutrition. Pages 12, 563, 564, 568, 569.
Mitchell, H. S., and G. M. Cook. Facts, Fads, and Frauds in Nutrition. Mass. Agr. Expt. Stat., April, 1937.
Rose, M. S. "Belief in Magic." Jour. Am. Diet. Assoc.: 8, 489, 1933.
Wilder, R. M. "Fads, Fancies, and Fallacies in Adult Diets." Sigma Quart.: 16, 110, 2170, 1938.
U. S. D. A. 1939 Yearbook. Food and Life. Pages 139-144.

G. Vocabulary of terms and words regarding fads and fallacies which one should be aware of and understand:

acidosis
acid skin
aid to digestion
brain food
chemicalized blood stream
chemical-type theory
cleansing system
dinitrophenol
elimination system
food concentrate
health food
health-giving
health system
incompatibility of foods
keep on the alkaline side
laxative
predigested food
scientifically balanced
thyroid

H. Problems.

1. List some fallacies about the "healthful" single food, food combinations, reducing, acidosis, special diet cures, roughage, and others, and answer each one in the light of the scientific information you have gained throughout the course. Give authority and the sources of material quoted in your answers. Use Table 73.

TABLE 73

Fads and Fallacies

Type of fad or fallacy	Scientific answer	Authority

2. Study of advertisements for food products.

   a. Collect ten to fifteen advertisements of food products which claim to have some special nutritional or "health"-giving property. Number them, and keep a record below of the numbers and the product they represent.

   b. Using Table 74, study each of the above advertisements carefully, and answer the questions concerning each one.

      What conclusions can you draw from the above study? Tabulate the results and conclusions of your study in some acceptable form.

TABLE 74

Evaluation of Advertising[1]

Questions	Advertisements															
Does the advertiser violate ethical standards and play on fear to promote the sale of his product?																
Is fear of poor health or of loss of good looks or endurance used furtively as means of increasing consumption?																
Is lack of romance, success, and friends attributed to some such cause as intestinal sluggishness?																
Would the effect of advertisement be to promote unfounded fear of illness if these foods could not be provided?																
Is the information that is set forth scientifically sound?																
Were the claims which are made for the product verified in a sufficient number of laboratories to be conclusive?																
Is the product likely to have the same value with human beings on ordinary diets as under the laboratory conditions listed, as for example with rats under experimental conditions on very restricted diets?																
Do claims savor of quackery?																
Are the implications regarding the product thoroughly honest, or are they so worded that the reader gains an erroneous impression even without a misstatement of the facts?																
Is there a deliberate attempt to deceive by the use of scientific terms and words unintelligible to the public?																

[1] J. I. Rowntree. "Criteria for Evaluation of Illustrative Material for Food and Nutrition Teaching." Adapted. Jour. Home Econ.: 26, 610, 1934. Courtesy, Journal of Home Economics.

Is the advertiser thoroughly ethical in his relation to the public?																
Is he attempting to practice medicine without a license?																
Is he prescribing for all kinds of human ills without regard to individual needs, encouraging people to self-medication, and thereby delaying proper treatment?																
Is he advertising his products for rheumatism, intestinal disorders, heart abnormalities, and infections that merit other attention?																
Does the advertiser refrain from unfavorable comparisons of his own with a competitor's product?																
Does he present his claims and let the public decide whether the merits of the product justify its consumption?																
Does the object of the advertising appear to be to teach pertinent points regarding the best use of the product or merely to increase its sales?																
Does blatancy of advertising overbalance the value of scientific points presented?																
Is there some means of judging whether the information has become obsolete?																
Are the name and training of person giving information indicated?																

3. Study of printed material on food and nutrition.

   a. Collect ten or fifteen booklets, charts, posters, etc., from commercial sources; assign a number to each; and record, below, the number, name of the piece of material, and source.

   b. Using the following check list, study each of the above materials carefully.

   c. What conclusions can you draw from this study?

How to Evaluate and Make Intelligent Use of Printed Material[1]

Check List

To help teachers, students, and club leaders to evaluate and make intelligent use of commercial materials.

This check list is intended for the use of teachers and club leaders in evaluating such materials as booklets, charts, posters, films, and recipe filing cards. These may be useful for their own reference, in the classroom, or for adult classes and clubs.

Any one piece of the material will not necessarily check on all the points listed but may nevertheless be valuable for certain purposes. The relative importance of each of the points depends on the way the commercial material is to be used. For example, a teacher might find that material which is scientifically accurate and therefore valuable for her own reference is not suitable for classroom use because it is hard to read and cluttered with irrevelent material; or a club chairman might find pictorial suggestions in material which is graphically presented but may be prevented by club rules from distributing it at a club meeting because it is brand advertising.

The purpose of this check list is not to give a numerical rating to educational and informational materials but to direct attention to certain desirable features. Reference to the check list may sharpen critical faculties and indicate important points to be considered and standards to be maintained. In this way the check list may serve as a useful tool in selecting and evaluating commercial materials.

I. Accuracy of subject matter.

- Free from half truths.
- Free from exaggerated statements.
- Backed by standard laboratory tests.
- Backed by recognized authorities.
- Backed by signature of author and his professional title.
- Backed by name of firm or organization publishing it.

II. Timeliness of subject matter.

- Furnishes the most recent information.
- Gives date of publication.
- Meets the needs of the times.
- Adds information to that available in most textbooks.

III. Methods of presentation.

- Factual, not cluttered with irrelevent material.
- Well organized.
- Simple, clear, brief.
- Attractive in form.
- Durable.
- Graphic, well illustrated.
- Easy to read, sight-saving.
- Appropriate for group for which it is intended.

IV. Subject matter unbiased.

- Clear-cut educational purpose.
- Information about products in general rather than promotion of specific brands.
- Free from advertising in text.
- Posters and charts free from advertising.

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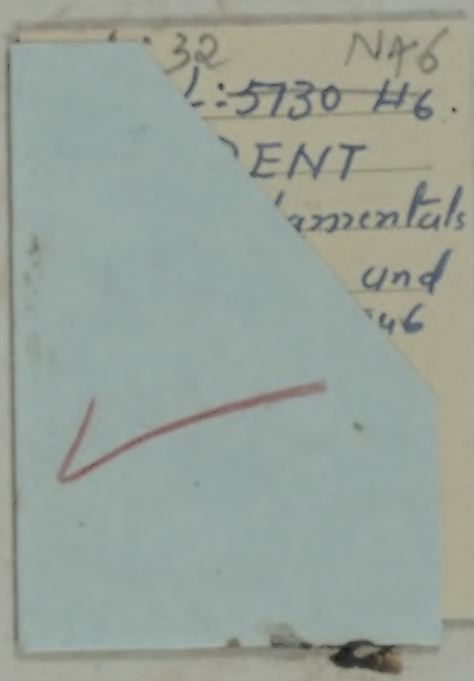
[1] "1940 Report of the Committee on Educational Use of Commercial Materials." Bulletin Amer. Home Economics Assoc.: Series 23, No. 1, September 1940, pages 52-54. Courtesy of the American Home Economics Association.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